213

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TRADE NAME	MODEL	SET AND FOLDER NO.
Ampex	400A, 401A Recorder	213-1
Bendix	FB21CU, FM21CU, HB21CU, HM21CU, KB21CU, KM21CU, TB21CU, TM21CU Tel. Rec.	213-2
David Bogen	"Twin"	213-3
Packard-Bell	2921, 2922 Tel. Rec.	213-4
Philco	AT-2294 (Code 128), 53-T2285, -L, 53-T2286, 53-T2287 (Code 126) Tel. Rec.	213-5
Philco	53-559	213-6
Roland	4T1	213-7
Studebaker	AC-2301 (S-5323)	213-8
V-M	150A	213-9
Video Products	Model 530—DX Series Tel. Rec.	213-10

PHOTOFACT* Folder

*TRADE MARK

BENDIX MODELS FB21CU, FM21CU, HB21CU, HM21CU, KB21CU, KM21CU, TB21CU, TM21CU

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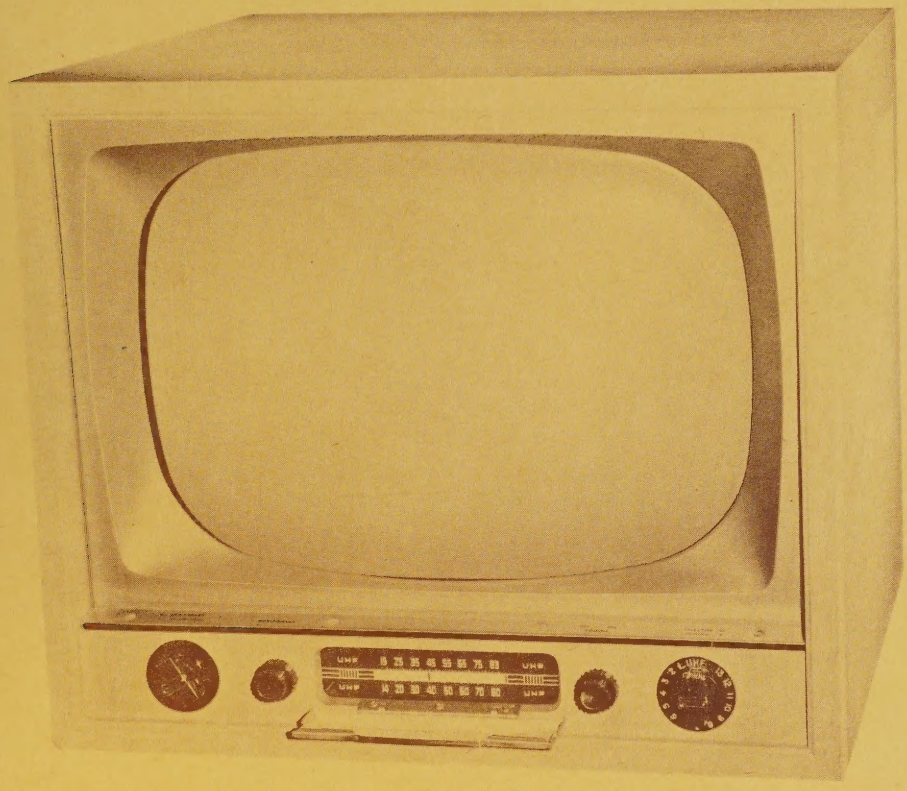

MODEL TB21CU

BENDIX MODELS FB21CU, FM21CU, HB21CU, HM21CU, KB21CU, KM21CU, TB21CU, TM21CU

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DATE 8-53 SET 213 FOLDER 2

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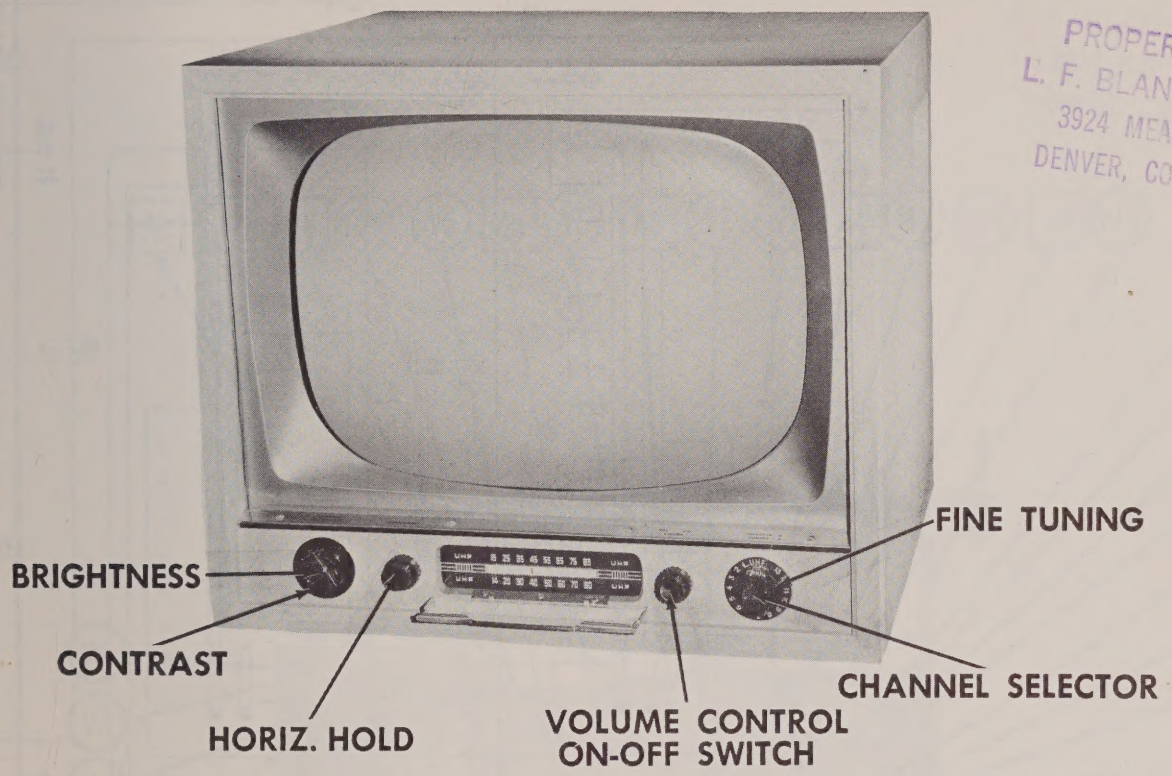

BENDIX MODELS
FB21CU, FM21CU, HB21CU, HM21CU,
KB21CU, KM21CU, TB21CU, TM21CU

BENDIX MODEL TB21CU

TRADE NAME	Bendix Models FB21CU, FM21CU, HB21CU, HM21CU, KB21CU, KM21CU, TB21CU, TM21CU
MANUFACTURER	Bendix Radio Div. of Bendix Aviation Corp., Baltimore, Md.
TYPE SET	Television Receiver
TUBES	Twenty-six
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING 1.78 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 (VHF), 14 thru 83 (UHF), Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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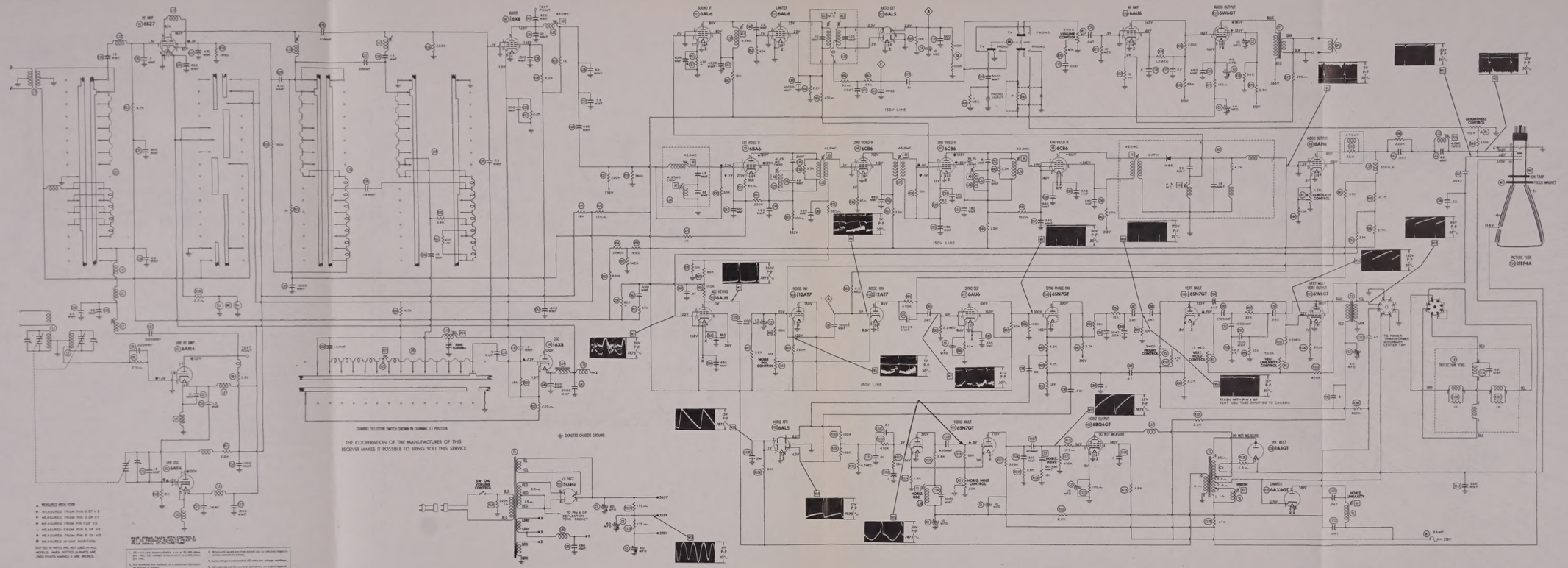

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BENDIX MODELS FB21CU, FM21CU, HB21CU, HM21CU, KB21CU, KM21CU, TB21CU, TM21CU

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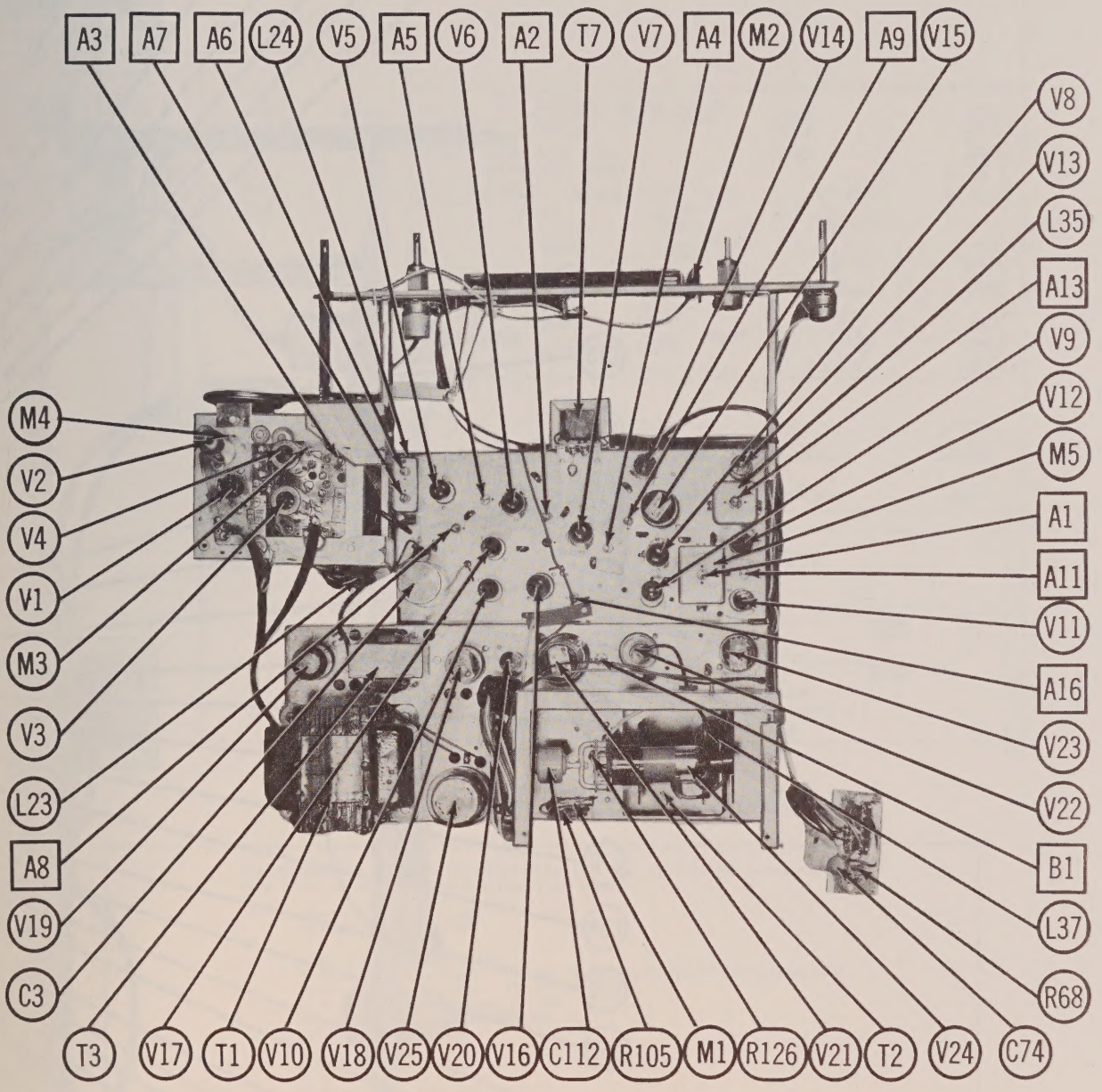

CHASSIS TOP VIEW

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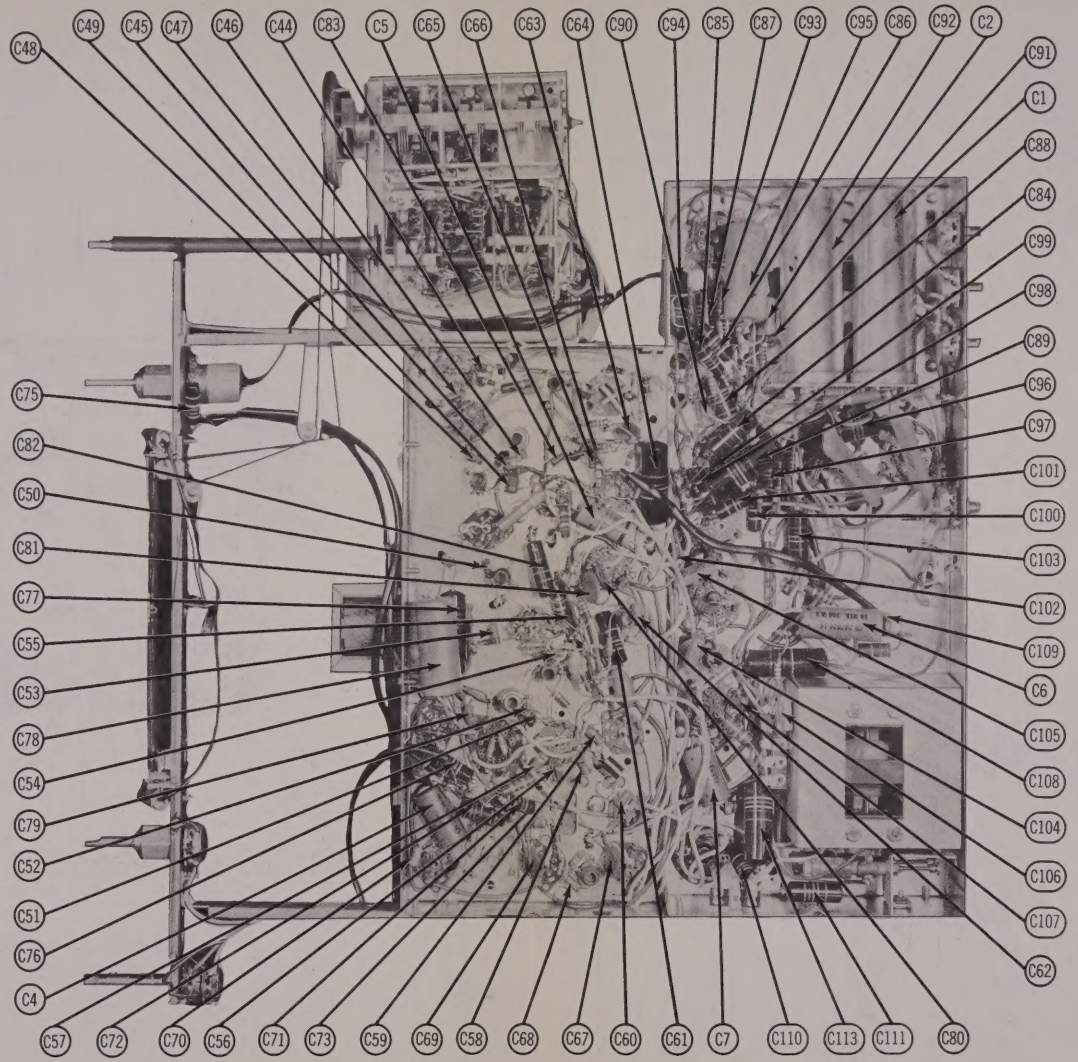

CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

TUBE PLACEMENT CHART

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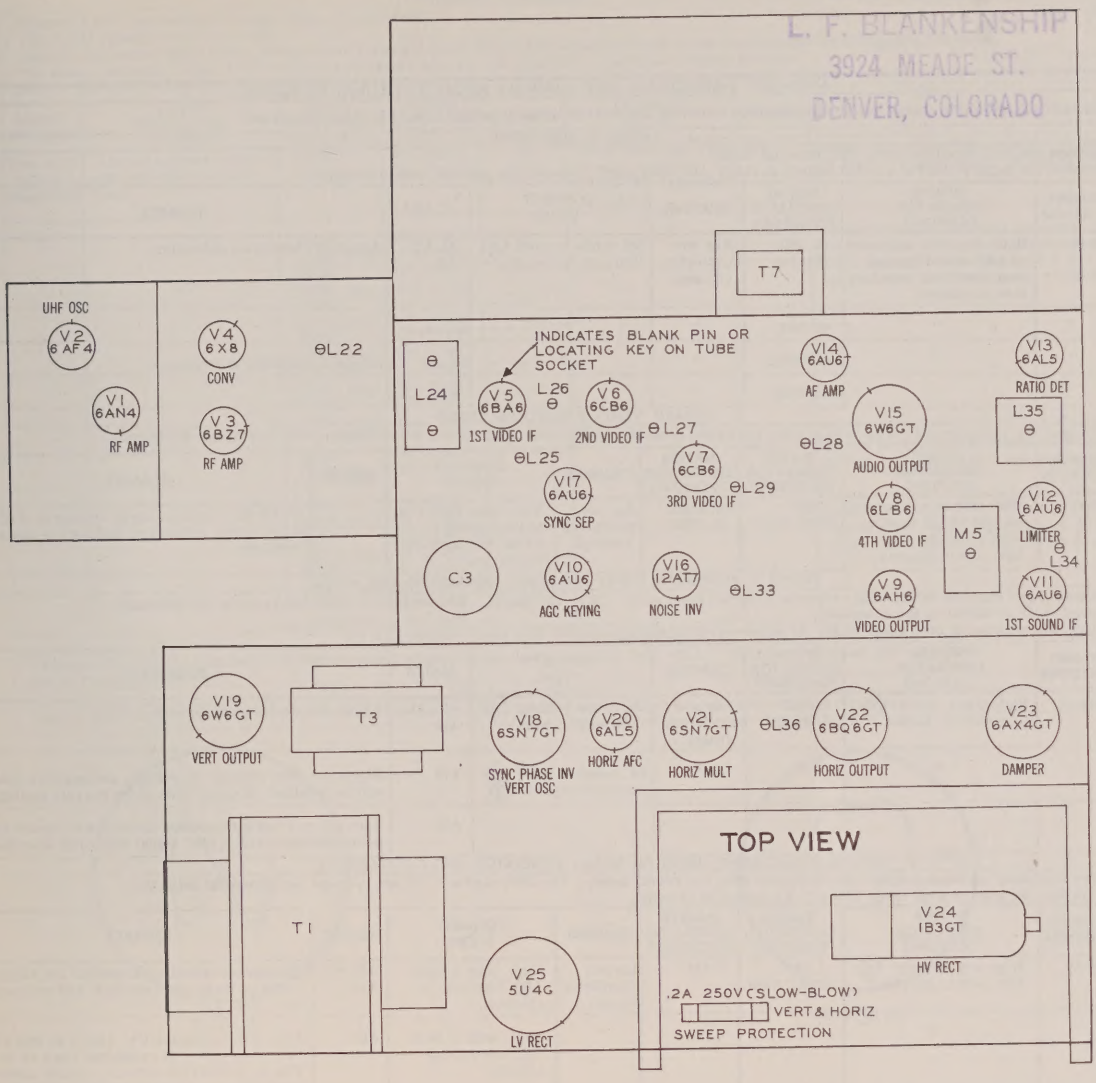

TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - V25

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V4, V5, V6, V7, V8, V15 (V1, V2 UHF position only)
No pic, no sound, has snow - V3, V4, V5
No pic, has sound, has raster - V9, V26
Has pic, no sound - V11, V12, V13, V14, V15
Overloaded picture - V10

SYNC FAILURE
No vert. sync - V18, V19
No horiz. sync - V18, V20, V21
No vert. or horiz. sync - V16, V17, V18

SWEEP FAILURE
No raster, has sound - V21, V22, V23, V24, V26 Fuse (M1)
No vertical deflection - V18, V19
Poor vert. linearity or foldover - V18, V19
Poor horiz. linearity or foldover - V21, V22, V23
Narrow picture - V21, V22, V23, V24, V25
Vert. off freq. - V18, V19
Horiz. off freq. - V18, V20, V21

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage shock hazard can be eliminated by removing the horizontal multivibrator tube, V21, from its socket.

VIDEO IF ALIGNMENT

Remove the AGC amplifier tube, V10, from its socket.
Connect the negative lead of a 3 volt battery to the IF AGC test point. Connect the positive lead to chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over converter tube. Low side to chassis.	45.0MC (Unmod)	Any non interfering channel.	DC probe to point (A) Common to chassis.	A1, A2, A3	Adjust for maximum deflection.
2.	"	"	42.0MC	"	"	A4, A5, A6	"
3.	"	"	41.25MC	"	"	A7, A8	Adjust for MINIMUM deflection
4.	"	"	39.75MC	"	"	A9	"

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
5.	Direct	High side to an ungrounded tube shield floating over converter tube. Low side to chassis.	43MC (10MC Swp)	41.25MC 45.75MC	Any non interfering channel.	Vert. amp thru 47KΩ to pin 1 (grid) of 6AH6 (V9). Low side to chassis.		Check for response curve similar to Fig. 1. If necessary retouch A1 thru A6 for desired response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (±1%) resistors in series from point (B) to chassis. The junction of these two resistors is alignment point (D) as shown on the schematic.
Increase the bias as used under Video IF alignment to -9 volts.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
6.	Direct	High side to point (A) Low side to chassis.	4.5MC (Unmod)	Any non interfering channel.	DC probe to point (B) Common to chassis.	A10, A11, A12	Adjust for maximum deflection.
7.	"	"	"	"	DC probe to point (C) Common to point (D)	A13	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
8.						A10	Turn A10 one full turn counter clockwise to insure maximum attenuation of 4.5MC signal into video amplifier.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60~ modulation and 450KC sweep. Use 120~ sawtooth voltage in scope for horizontal deflection.
Increase the bias as used under Video IF Alignment to -9 volts.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	Direct	High side to point (A) Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any non interfering channel.	Vert. amp to point (B) Low side to chassis.	A10, A11, A12	Disconnect stabilizer capacitor C4. Adjust for curve of maximum amplitude and symmetry as in Fig. 2.
7.	"	"	"	"	"	Vert. amp to point (C) Low side to chassis.	A13	Reconnect capacitor C4. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 3. SLIGHTLY retouch A12 for maximum amplitude and straightness of crossover lines
8.							A10	Turn A10 one full turn counter clockwise to insure maximum attenuation of 4.5MC signal into video amplifier.

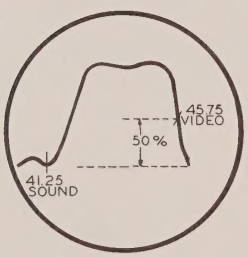

FIG. 1

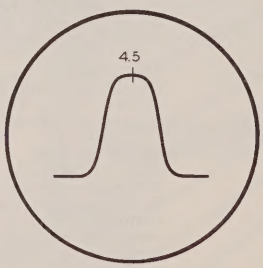

FIG. 2

ALIGNMENT INSTRUCTIONS (CONT.)

OSCILLATOR ALIGNMENT

Connect 3 volt bias battery as under Video IF Alignment.
V10 should remain out of its socket.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

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	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. amp thru 47KΩ to pin 1 (grid) of 6AH6 (V9). Low side to chassis.	A14	Adjust to place sound marker in trap notch as in Fig. 4. Video marker should be at 50%.
10.	"	"	207MC (10MC Swp)	205.25MC 209.75MC	12	"		Check high band channels for sound marker placement as in Fig. 4. If necessary make slight compromise adjustment of A14 for best marker placement on all channels.
			201MC (10MC Swp)	199.25MC 203.75MC	11			
			195MC (10MC Swp)	193.25MC 197.75MC	10			
			189MC (10MC Swp)	187.25MC 191.75MC	9			
			183.25MC (10MC Swp)	181.25MC 185.75MC	8			
			177MC (10MC Swp)	175.25MC 179.75MC	7			
11.	"	"	85MC (10MC Swp)	83.25MC 87.75MC	6	"	A15	Adjust to place sound marker in trap notch as in Fig. 4. Video marker should be at 50%.
12.	"	"	79MC (10MC Swp)	77.25MC 81.75MC	5	"		Check low band channels for sound marker placement as in Fig. 4. If necessary make slight compromise adjustment of A15 for best marker placement on all channels.
			69MC (10MC Swp)	67.25MC 71.75MC	4			
			63MC (10MC Swp)	61.25MC 65.75MC	3			
			57MC (10MC Swp)	55.25MC 59.75MC	2			

RF ALIGNMENT AND UHF TUNER ALIGNMENT

These portions of the receiver have been properly aligned at the factory and are very stable. Alignment of these portions should not be required in the field.

4.5MC TRAP ALIGNMENT

Tune in a TV station and examine picture for indication of 4.5MC interference. If any is noted adjust A16 to minimize it.

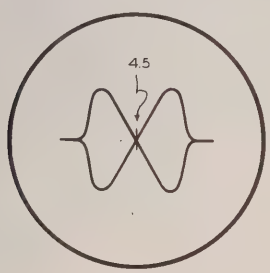


FIG. 3

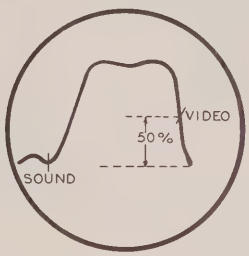
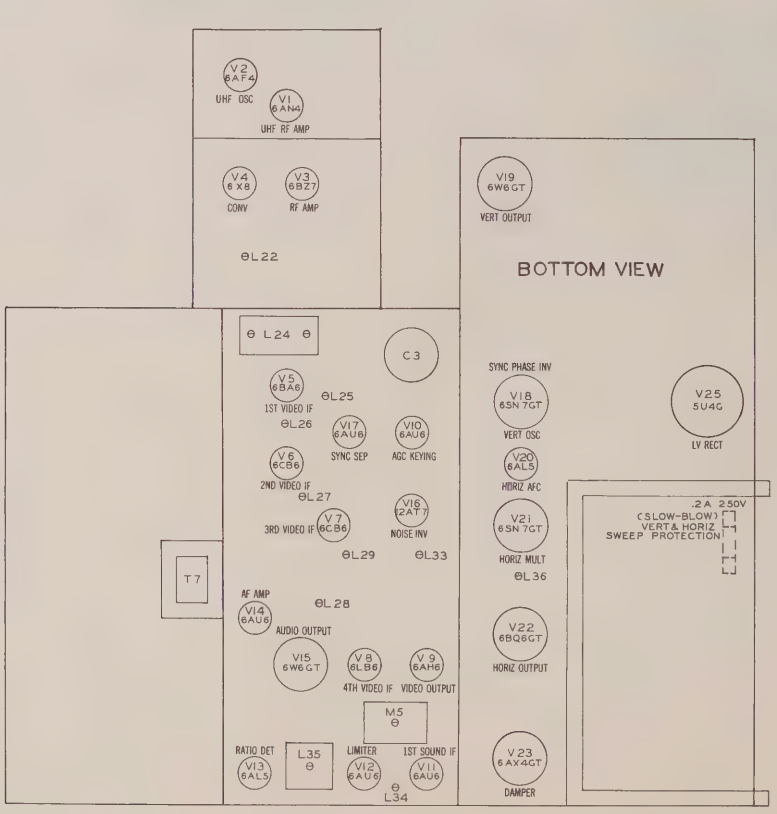


FIG. 4

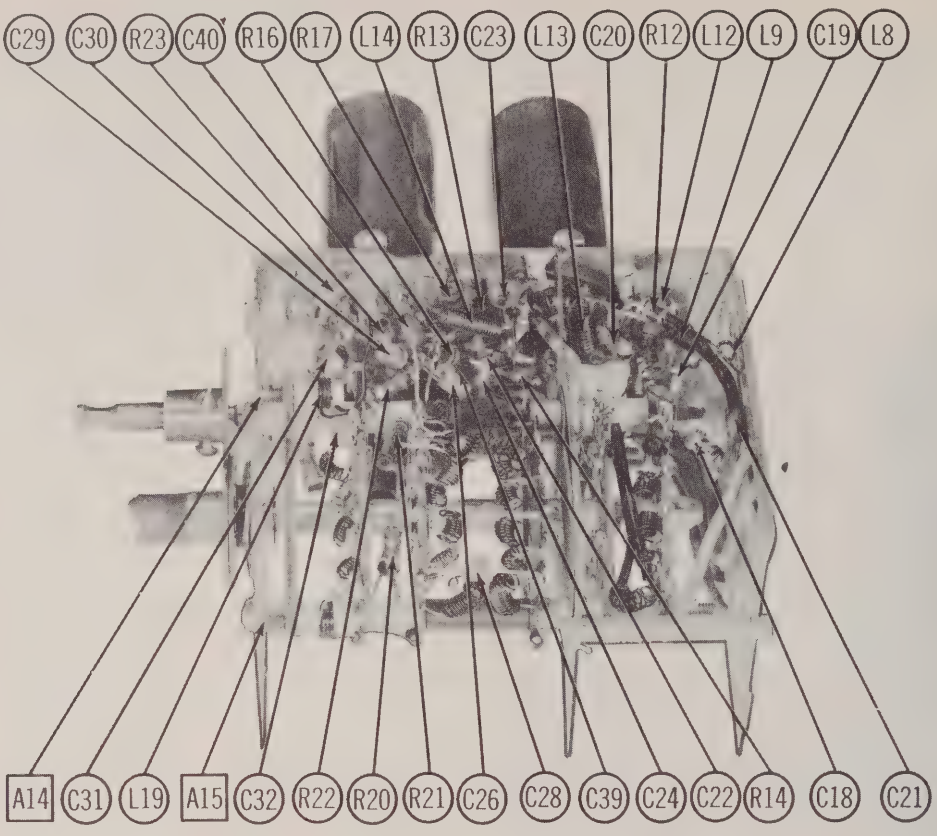
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AN4	ǂ3.5KΩ	0Ω	.1Ω	0Ω	270Ω	0Ω	ǂ3.5KΩ		
# V 2	6AF4	ǂ2.4KΩ	15KΩ	.1Ω	0Ω	0Ω	15KΩ	ǂ2.4KΩ		
V 3	6BZ7	†222KΩ	1 Meg	INF	.1Ω	0Ω	INF	740KΩ	0Ω	0Ω
V 4	6X8	0Ω	15.2KΩ	ǂ5KΩ	0Ω	.1Ω	220Ω	220KΩ	ǂ2.4KΩ	ǂ1.2KΩ
V 5	6BA6	†135KΩ	†220KΩ	ǂ0Ω	ǂ.1Ω	†285Ω	†285Ω	†220KΩ		
V 6	6CB6	50KΩ	47Ω	0Ω	.1Ω	ǂ3.3KΩ	ǂ3.3KΩ	0Ω		
V 7	6CB6	2.7KΩ	2.8KΩ	.1Ω	0Ω	ǂ22KΩ	ǂ22KΩ	2.7KΩ		
V 8	6CB6	ǂ22KΩ	ǂ22KΩ	ǂ0Ω	ǂ.1Ω	†3.1KΩ	†3.1KΩ	ǂ22.1KΩ		
V 9	6AH6	4.7KΩ	0Ω	0Ω	.1Ω	ǂ5.4KΩ	ǂ220KΩ	30Ω		
V 10	6AU6	ǂ36KΩ	ǂ0Ω	ǂ0Ω	ǂ.1Ω	265KΩ	†350Ω	ǂ0Ω		
V 11	6AU6	3Ω	0Ω	0Ω	.1Ω	ǂ15KΩ	ǂ15KΩ	220Ω		
V 12	6AU6	47KΩ	0Ω	0Ω	.1Ω	2.2KΩ	2.2KΩ	0Ω		
V 13	6AL5	INF	INF	0Ω	.1Ω	0Ω	0Ω	12KΩ		
V 14	6AU6	10Meg	0Ω	0Ω	.1Ω	†290KΩ	†1.3Meg	10Ω		
V 15	6W6GT	†68KΩ	ǂ.1Ω	†288Ω	†4KΩ	†290KΩ	†350Ω	ǂ0Ω	30KΩ	
V 16	12AT7	ǂ0Ω	ǂ19KΩ	ǂ220KΩ	0Ω	0Ω	ǂ565KΩ	2.2Meg	800Ω	.1Ω
V 17	6AU6	2.2Meg	33KΩ	0Ω	.1Ω	†32KΩ	ǂ0Ω	33KΩ		
V 18	6SN7GT	100KΩ	†3KΩ	25KΩ	2.1Meg	▲1.8Meg	3.3KΩ	0Ω	.1Ω	
V 19	6W6GT	†2.5KΩ	.1 Ω	†6.4KΩ	†6.4KΩ	3.3Meg	1.1Meg	0Ω	68Ω	
V 20	6AL5	33KΩ	33KΩ	0Ω	.1Ω	4.9Meg	0Ω	4.9Meg		
V 21	6SN7GT	5.1Meg	▲27.6KΩ	1.8KΩ	72KΩ	▲277KΩ	1.8KΩ	.1Ω	0Ω	
V 22	6BQ6GT	INF	.1Ω	INF	†22.3KΩ	470KΩ	INF	0Ω	100Ω	Top Cap ▲9Ω
V 23	6AX4GT	INF	INF	350KΩ	INF	†350Ω	INF	ǂ0Ω	ǂ.1Ω	
V 24	1B3GT	PINS 1 - 8 HAVE INF RESISTANCE								Top Cap ▲384Ω
V 25	5U4G	†175Ω	40KΩ	INF	24.5Ω	220KΩ	23Ω	ǂ19KΩ	40KΩ	
V 26	21EP4A	0Ω	360KΩ	Pin 10 ▲47KΩ	Pin 11 ǂ225KΩ	Pin 12 .1Ω				

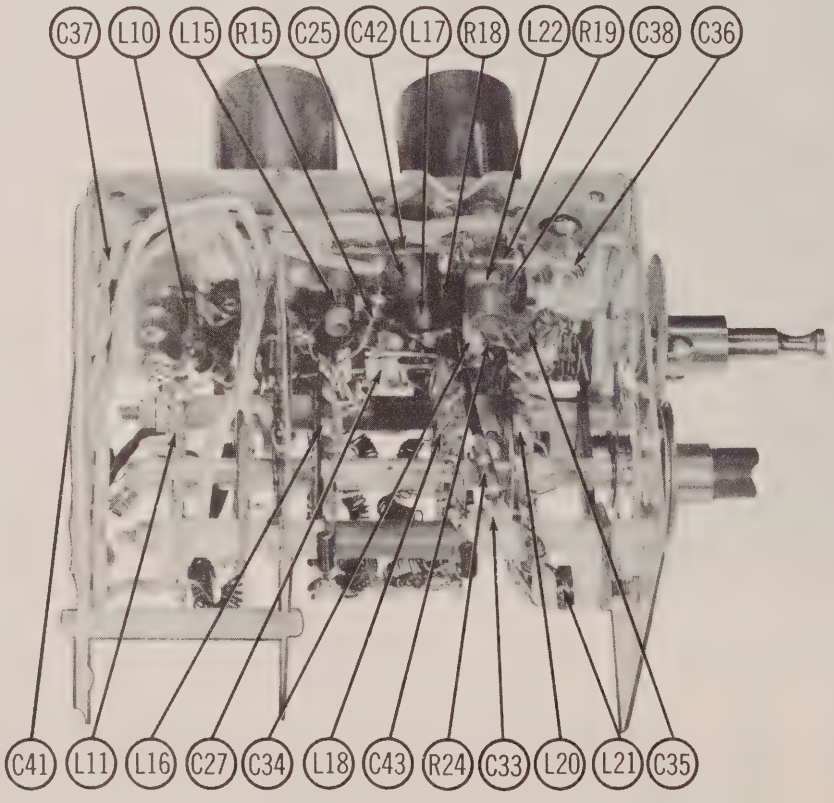
ALL MEASUREMENTS IN VHF POSITION UNLESS NOTED.
▲ MEASURED FROM PIN 3 OF V23.
ǂ MEASURED FROM 150V LINE.
† MEASURED FROM PIN 2 OF V25.
# MEASURED IN UHF POSITION.



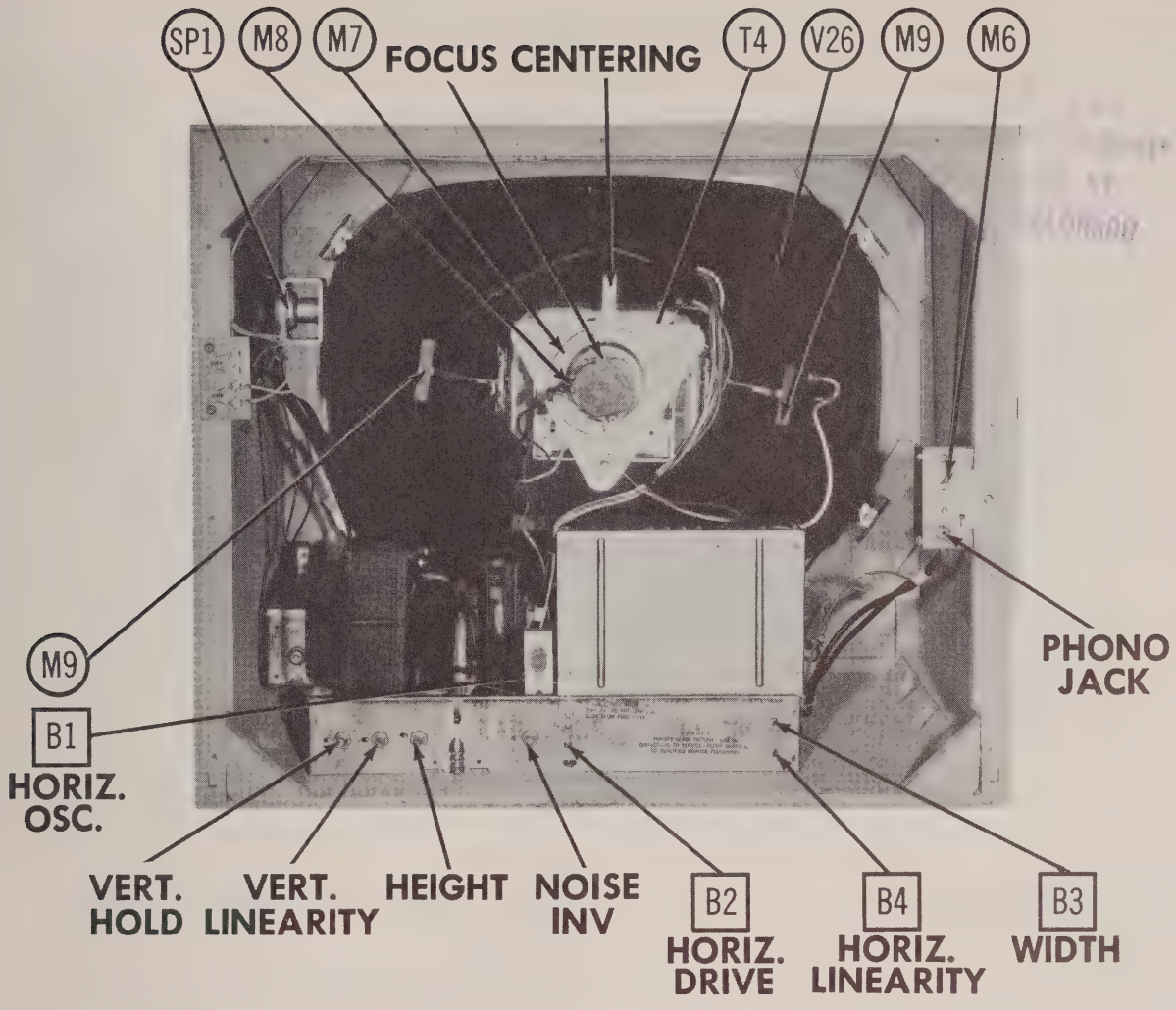
TUBE PLACEMENT CHART



RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE



CABINET-REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

Set the horizontal hold control at the middle of its range.

Set the contrast control for normal operation.

Adjus t the horizontal oscillator slug (Bl) until the picture synchronizes horizontally.

Turn the horizontal hold control to each extreme end of its rotation to see that the sync range is centered.

If necessary, slight readjustment of Bl should give the desired effect.

Set the channel selector switch to a point between any two channels.

Set the contrast control fully counter clockwise.

Connect the DC probe of a VTVM to pin 8 (cathode) of 6BQ6GT (V22). Connect the common lead to chassis.

Turn the horizontal drive trimmer (B2) clockwise, not allowing the voltage on VTVM to exceed 15 volts. (On some sets this much voltage may not be obtained).

The correct adjustment of B2 may then be reached by turning B2 counter clockwise while observing the VTVM reading. There will be a rapid voltage drop of approximately $1\frac{1}{2}$ to 3 volts to a point where further rotation of B2 will cause only a slight decrease in voltage reading. This point is the proper setting of B2.

Adjust the width slug (B3) for a picture slightly wider than necessary to fill the picture mask horizontally. Adjust the horizontal linearity slug (B4) for a picture that is symmetrical from left to right.

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

See "LOSS OF HIGH VOLTAGE".

INSUFFICIENT SWEEP

Substitute V21, V22 and V23. Check waveform atW17.

If Satisfactory	If Unsatisfactory
Check C108, C110, C111, R124, T2, T5 and other associated components.	Check C106, C107, Horizontal Drive trimmer (B2), R118, R125 and other components associated with V21.

DRIVE LINES

Substitute V22 and V23. Check setting of horizontal drive trimmer (B2). Check C110 and C111. Check yoke and T2.

COMPRESSED LEFT SIDE

Substitute V22 and V23. Check setting of width coil (B3) and horizontal linearity coil (B4). Check T2, C108 and other associated components.

FOLDS

Substitute V22 and V23. Check setting of horizontal drive trimmer (B2). Check C110, C111, T2 and other associated components. Check yoke.

XMAS TREE EFFECT

Substitute V21. Check C104 for open. Check L36 for shorted turns.

VERTICAL

LOSS OF SWEEP

Substitute V18 and V19. Check waveform at W11.

If Satisfactory	If Unsatisfactory
Check T3, C96 and yoke.	Check C91, C92, C93, C94 and other associated components.

INSUFFICIENT SWEEP

Substitute V18 and V19. Check C2B, T3, yoke and other components associated with V18 and V19.

COMPRESSED TOP AND BOTTOM EXPANDED CENTER

Check R101, R103 and R6 for change of value.

FOLDS

Substitute V18 and V19. Check C94 for leakage.

SYNC

HORIZONTAL

LOSS OF SYNC

Substitute V20 and V21. Check C100, C109, C98, C99 and other components associated with V20 and V21.

CRITICAL SYNC

Substitute V20 and V21. Proceed as outlined under "LOSS OF SYNC".

PULLING PICTURE

Substitute V9, V10, V16, V17, V18, V20 and V21. Check signal at W2 for overload and sync clipping.

If Satisfactory	If Unsatisfactory
Check waveform at W8.	Check components associated with V9 for change of value or shorting.

If waveform W8 is;

Satisfactory	Unsatisfactory
Check C101, C102, C103 and other components associated with V21 and V22.	Substitute V17 and V18. Check C82 and other associated components.

VERTICAL

LOSS OF SYNC

Substitute V18. Check C85, C86, C87 and C88. Check R93, R94 and R95. Check other components associated with V18.

CRITICAL SYNC

Substitute V18. Check C85, C86, C87, C88, C94, R93, R94, R95 and other components associated with V18.

ONE WAY SYNC

Substitute V18. Check C94 for leakage.

TRIGGERING

Substitute V16, V17 and V18. Check circuit near these stages for heater to cathode leakage.

VIDEO

LOSS OF VIDEO

Substitute V9. Check components associated with V9. Check picture tube.

SOUND BARS

Check setting of local oscillator. Check adjustment of 4.5MC trap (A16).

POOR RESOLUTION

Substitute V3, V5, V6, V7, V8 and V9. Check video IF components and alignment. Check video detector crystal and detector assembly.

POOR CONTRAST

Substitute V9. Check waveform at W1.

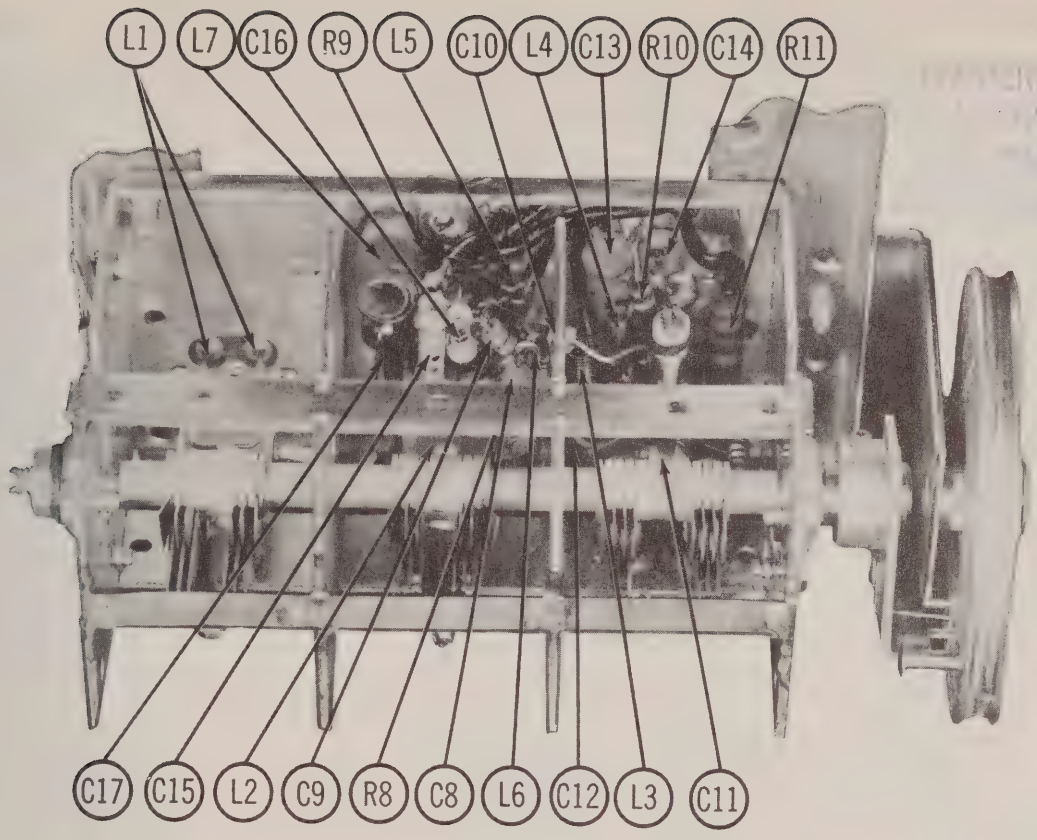
If Satisfactory	If Unsatisfactory
Check components R45, R46, R48, C61 and L31. Check picture tube.	Check crystal detector assembly (M5).

SMEAR

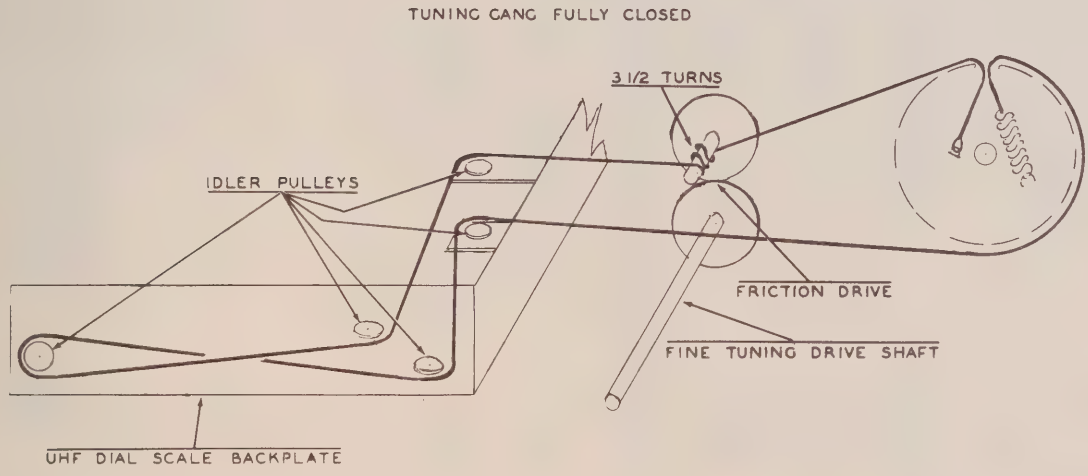
Substitute V9. Proceed as outlined under "POOR CONTRAST".

ONE BLACK BAR ACROSS PICTURE

Check V3, V4, V5, V6, V7, V8 and V9 for heater to cathode leakage. In case of UHF also check V1 and V2 for heater to cathode leakage.



UHF TUNER



UHF DRIVE CORD

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No	USE	REPLACEMENT DATA: BENDIX PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RTMA BASE TYPE	NOTES
V1	UHF RF Amp.	6AN4	6AN4	7DK	
V2	UHF Oscillator	6AF4	6AF4	7DK	
V3	RF Amplifier	6BZ7	9A1	9AK	
V4	Converter	6X8	6X8	9AK	
V5	1st. Video IF Amp.	6BA6	6BA6	7BK	
V6	2nd. Video IF Amp.	6CB6	6CB6	7CM	
V7	3rd. Video IF Amp.	6CB6	6CB6	7CM	
V8	4th. Video IF Amp.	6CB6	6CB6	7CM	
V9	Video Output	6AB6	6AB6	7BK	
V10	AGC Keying	6AU6	6AU6	7BK	
V11	1st. Sound IF Amp.	6AU6	6AU6	7BK	
V12	Limiter	6AU6	6AU6	7BK	
V13	Ratio Detector	6AL5	6AL5	8PT	
V14	AF Amplifier	6AU6	6AU6	7BK	
V15	Audio Output	6W6GT	6W6GT	7S	
V16	Noise Inverter	12AT7	12AT7	9A	
V17	Sync Separator	6AU6	6AU6	7BK	
V18	Sync Phase Inv. Vert. Oscillator	6SN7GT	6SN7GT	8BD	
V19	Vert. Output	6W6GT	6W6GT	7S	
V20	Horiz. AFC	6AL5	6AL5	8PT	
V21	Horiz. Mult.	6SN7GT	6SN7GT	8BD	
V22	Horiz. Output	6BQ6GT	6BQ6GT	8AM	
V23	Damper	6AX4GT	6AX4GT	4CG	
V24	HV Rectifier	1B3GT	1B3GT	3C	
V25	LV Rectifier	5U4G	5U4G	5T	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: BENDIX PART No.	REPLACEMENT DATA: SYLVANIA PART No.	RTMA BASE TYPE	NOTES
V26	21EP4A	21EP4A	12D	① Circuit Changes Necessary
		21EP4 ①	12D	
		21FP4 ①	12C	
		21FP4A ①	12C	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: BENDIX PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C1A	±80	450	267005-8	AFH3-46		CO37		FP378	TVL-3782	
B	±40	450								
C	±10	450								
C2A	±40	450	267005-8	AFH3-46		CO37		FP378	TVL-3782	
B	±10	450								
C	±10	200	267005-10	AFH4-41		DO36		FP385	TVL-3762	
C4	10	50	267024-16	PRS350/10		BR105		TC32	TVA-1304	
C5	2	50	267024-17	PRS150/4		BBR2-50T		TC302	TVA-1301	
C6	10	300	267024-16	PRS350/10		BR1045A		TC52	TVA-1504	
C7	10	50	267024-16	PRS50/10		BR105		TC32	TVA-1304	
C8	220									
C9	1			SI2.2NP0	TCZ-2.2		NP0K-020		5TCCB-V22	
C10	1.5						N330K-1R5			
C11	1.5						N330K-1R5			
C12	.7				TCZ-.68		NP0K-R7			
C13	1000			BPD-001	DD-102	TM5D1	801-001		DC-521	5HK-D1
C14	1000			BPD-001	DD-102	TM5D1	801-001		DC-521	5HK-D1
C15	82						N330K-820			
C16	25						N330K-250			
C17	1000			BPD-001	DD-102	TM5D1	801-001		DC-521	5HK-D1
C18	22			SI22NP0	TCZ-22		NP0K-220			5TCC-Q23
C19	10						N330K-150			
C20	3			SI3NP0			NP0K-030	Z7-553		
C21	800			BPD-0008	DD-801	TM5T8	801-001		DC-521	5GA-T8
C22	470									
C23	800			BPD-0008	DD-801	TM5T8	801-001		DC-521	5GA-T8
C24	470			SI470	DS-471	TM5T5	GP2K-471		UC-5347	5GA-T47
C25	1000			BPD-001	DD-102	TM5D1	801-001		DC-521	5HK-D1
C26	.33						NP0K-R33			
C27	.36						NP0K-R36			
C28	1.8						N750K-1R8			
C29	.75						NP0K-R75	Z7-5575		
C30	1.5						N330K-1R5			
C31	10						N470K-100			
C32	1.5			SI1.5NP0	TCZ-1.5		NP0K-1R5	Z7-5515	5TCCB-V15	
C33	1.6						NP0K-1R6			
C34	15						N330K-150			
C35	10			SI10NP0	TCZ-10		NP0K-100	Z7-541	5TCC-Q1	
C36	82						N330L-820			
C37	7.5						NP0K-7R5			
C38	1000			BPD-001	DD-102	TM5D1	801-001		DC-521	5HK-D1
C39	1000			BPD-001	DD-102	TM5D1	801-001		DC-521	5HK-D1
C40	800			BPD-0008	DD-801	TM5T8	801-001		DC-521	5GA-T8
C41	5000		267037-502	BPD-005	MD-502	TM5D5	81L-005		DC-525	5HK-D5
C42	1000			BPD-001	DD-102	TM5D1	801-001		DC-521	5HK-D1
C43	800			BPD-0008	DD-801	TM5T8	801-001		DC-521	5GA-T8
C44	680		267032-9	SI680	D6-681		GP2K-681		UC-5368	5GA-T68
C45	2						NP0K-020			
C46	62	500								
C47	680		267032-9	SI680	D6-681		GP2K-681		UC-5368	5GA-T68
C48	680		267032-9	SI680	D6-681		GP2K-681		UC-5368	5GA-T68
C49	680		267032-9	SI680	D6-681		GP2K-681		UC-5368	5GA-T68
C50	680		267032-9	SI680	D6-681		GP2K-681		UC-5368	5GA-T68
C51	5			SI5NP0	TCZ-4.7		NP0K-050		ZT-555	5TCCB-V47
C52	62	500								
C53	680		267032-9	SI680	D6-681		GP2K-681		UC-5368	5GA-T68
C54	680		267032-9	SI680	D6-681		GP2K-681		UC-5368	5GA-T68
C55	680		267032-9	SI680	D6-681		GP2K-681		UC-5368	5GA-T68

CAPACITORS (CONT.)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: BENDIX PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C56	680		267032-9	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C57	680		267032-9	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C58	680		267032-9	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C59	680		267032-9	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C60	680		267032-9	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C61	.047	200	267056-473	P288-047	DF-503	PJ2S5		PT4147	2TM-S47	
C62	82	500								
C63	5000		267037-502	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C64	.47	200	267036-474	P288-47		PJ2P5		PT405	2TM-P47	
C65	680		267032-9	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C66	680		267032-9	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C67A	4000		267052-402	BPD-2X004	DD-2-502	TM5DD4	822-004	DCD-524	5HK-2D4	
B	4000									
C68	22		267032-1	SI22	D6-220		GP1K-220	UC-5422	5GA-Q22	
C69	10000		267037-103	BPD-01	DD-1032	TM5S1	81L-01	DC-51	5HK-S1	
C70	1000		267032-17	SI1000	D9-102	TM5D1	GP2L-102	UC-521	5HK-D1	
C71	.0027	400	267059-272							
C72	.0022	400	267036-222	P688-0022	D6-223	PTE5D22	GP2-333-222	PT6222	6TM-D22	
C73	.01	400	267036-103	P468-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C74	5000		267037-502	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C75	.0047	400	267059-472	P688-0047	D6-472	PTE5D47	GP2-333-472	PT6247	6TM-D47	
C76	.047	200	267056-473	P288-047	DF-503	PJ2S5		PT4147	2TM-S47	
C77	.22	400	267036-224	P468-22		PTE4P22		PT4022	4TM-P22	
C78	.5	400	267036-474	484-5		PJ4P5		PT405	4TM-P5	
C79	680		267032-9	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C80	5000		267037-502	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C81	20000		267037-203	BPD-02	DD-203				5HK-S2	
C82	.047	200	267056-473	P288-047	DF-503	PJ2S5		PT4147	2TM-S47	
C83	680		267032-9	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C84	.1	200	267058-104	P288-1	DF-104	PJ2P1		PT401	2TM-P1	
C85	.0047	600	267060-472	P688-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	
C86	.0047	600	267060-472	P688-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	
C87	.047	400	267055-473	P468-047	DF-503	PTE4S47		PT4147	4TM-S47	
C88	.047	800	267055-473	P688-047	DF-503	PTE8S47		PT8147	8TM-S47	
C89	.47	200	267036-474	P288-47		PJ2P5		PT405	2TM-P47	
C90	2700	500	CM24A272K							
C91	1000	500	CM24A102K	1464-001		2R5D1		MC2S55	MS-21	
C92	1000	500	CM24A102K	1464-001		2R5D1		MC2S55	5HK-D5	
C93	.033	600	267055-333	P668-033		PTE6S3		PT6133	6TM-S3	
C94	.047	800	267055-473	P688-047	DF-503	PTE8S47		PT8147	8TM-S47	
C95	.5	400	267036-474	484-5		PJ4P5		PT405	4TM-P5	
C96	.22	200	267056-224	P488-22		PTE4P22		PT4022	2TM-P22	
C97	.0033	400	267036-332	P688-0033	D6-332	PTE6D33	GP2-333-332	PT6233	6TM-D3	
C98	.001	400	267036-102	P688-001	D6-102	PTE6D1	GP2L-102	PT621	6TM-D1	
C99	.001	400	267036-102	P668-001	D6-102	PTE6D1	GP2L-102	PT621	6TM-D1	
C100	.0047	400	267059-472	P688-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	
C101	.01	400	267059-103	P468-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C102	.01	400	267059-103	P468-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C103	.1	200	267058-104	P288-1	DF-104	PJ2P1		PT401	2TM-P1	
C104	3900	500	CM243902K	1464-004		IDB5D4		MC2463	MS-24	
C105	430	500	CM22A431K							
C106	330	500	CM22A331K							
C107	470		267032-39	SI470	D6-471	TM5T5	GP2K-471	UC-5347	5GA-T47	
C108	.1	500	267055-104	P668-1	DF-104	PTE5P1		PT501	5TM-P1	
C109	1000	500	CM24A102K	1464-001	D6-102	IW5D1	GP2L-102	MC255	1TM-21	
C110	.047	400	267055-473	P468-047		PTE4S47		PT4147	4TM-S47	
C111	.047	400	267059-473	P468-047		PTE4S47		PT4147	4TM-S47	
C112	250	20000	267065-2							
C113	.47	200	267036-474	P288-47		PJ2P5		PT405	2TM-P47	
C114	62	2000							20GA-Q62	

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: BENDIX PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	100KΩ		LM62045-1B	QJ-367*	RTV-373		UF15L) †	Brightness-Panel
B	1200Ω						UR15L) †	Contrast-Rear
R2A	30KΩ		CH282022-4	QH-121	AG-42-S	B-26	U-35	Horiz. Hold
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R2A
R3A	500KΩ		CH282041-2	QH-133X	A7-90	BT-65-S	UT-431	Volume Tap@ 300KΩ
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R3A
C	Switch		Not Req.	Not Req.	SW-A	Not Req.	UB-36	Attach to R3A
R4A	10KΩ		CH282025-15	QH-116	AG-27-S	AB-14	SU-20	Noise Inverter
B	Shaft		Not Req.	Not Req.	FK3-1/4	AK-1	Not Req.	Attach to R4A
R5A	3 Meg		OCH282025-12	QH-140	AG-84-S	AB-84	SU-59	Height
B	Shaft		Not Req.	Not Req.	FK3-1/4	AK-1	Not Req.	Attach to R5A
R6A	600KΩ		OCH282025-13	QH-134	AG-58-S	AB-59	SU-50	Vert. Linearity
B	Shaft		Not Req.	Not Req.	FK3-1/4	AK-1	Not Req.	Attach to R7A
R7A	1.5Meg		OCH282025-14	QH-138	AG-83-S	AB-75	U-155	Vert. Hold
B	Shaft		Not Req.	Not Req.	FK3-1/4	AK-1	Not Req.	Attach to R7A

* CONCENTRIKIT EQUIVALENT-KIT K-2, BASE ELEMENTS & SHAFTS B11-128 & P1-123 (Panel B17-209 & R1-209 (Rear).

† UNIVERSAL REPLACEMENT - (MALLORY EXACT DUPLICATE PART NO.UE11G).

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: BENDIX PART No.	IRC PART No.	NOTES
R8	270Ω			BTS-270	
R9	330Ω			BTS-330	
R10	15KΩ				
R11	2200Ω			BTA-2200	
R12	4700Ω			BTS-4700	
R13	1 Meg-5%				
R14	750KΩ-5%				
R15	1000Ω			BTS-1000	
R16	220KΩ				
R17	2200Ω			BTS-2200	
R18	2200Ω			BTS-2200	
R19	1000Ω			BTS-1000	
R20	3900Ω			BTS-3900	
R21	470Ω			BTS-470	
R22	220Ω			BTS-220	
R23	15KΩ			BTS-15K	

RESISTORS (CONT.)

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: BENDIX PART No.	IRC PART No.	NOTES
R24	4700Ω			BTS-4700	
R25	18KΩ		RC25A183K	BTS-18K	
R26	150Ω		RC25A151K	BTS-150	
R27	220KΩ		RC23A224K		
R28	390KΩ-5%		RC25A394J		
R29	1000Ω		RC24A102K	BTA-1000	
R30	3300Ω-5%		RC25A332J	BTS-3300-5%	
R31	68Ω-5%		RC25A680J	BTS-68-5%	
R32	220KΩ		RC23A224K		
R33	100Ω		RC25A101K	BTS-100	
R34	33000-5%		RC25A333J	BTS-3300-5%	
R35	680Ω		RC23A681K	BTS-680	
R36	470-5%		RC25A470K	BTS-47-5%	
R37	3300Ω		RC25A332K	BTS-3300	
R38	10KΩ-5%		RC23A103J		
R39	82Ω		RC25A820K	BTS-82	

RESISTORS (CONT.)

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: BENDIX PART No.	IRC PART No.	NOTES
R40	22KΩ		RC23A223K	BTS-22K	
R41	150Ω		RC25A151K	BTS-150	
R42	33000-5%		RC25A332J	BTS-3300-5%	
R43	2700Ω	1	RC23A272K	BTA-2700	
R44	1000Ω		RC25A102K	BTS-1000	
R45	2700Ω	1	RC24A272K	BTA-2700	
R46	2700Ω	1	RC24A272K	BTA-2700	
R47	47KΩ		RC23A473K	BTS-47K	
R48	220KΩ		RC25A224K	BTS-220K	
R49	330KΩ		RC25A334K	BTS-330K	
R50	100KΩ		RC25A104K	BTS-100K	
R51	150KΩ		RC25A154M	BTS-150K	
R52	33KΩ		RC25A333K	BTS-33K	
R53	47KΩ		RC25A473K	BTS-47K	
R54	620KΩ-5%		RC25A624J	BTS-620K-5%	
R55	680KΩ		RC23A684K	BTS-680K	
R56	3.9Meg-5%		RC23A395J	BTS-3.9Meg-5%	
R57	1 Meg-5%		RC23A105J	BTS-1Meg-5%	
R58	1 Meg-5%		RC23A105J	BTS-1Meg-5%	
R59	51KΩ-5%		RC23A513J	BTS-51K-5%	
R60	68KΩ-5%		RC23A683J	BTS-68K-5%	
R61	220Ω		RC25A221K	BTS-220	
R62	15KΩ		RC25A153K	BTS-15K	
R63	47KΩ		RC23A473K		
R64	2200Ω		RC25A222K	BTS-2200	
R65	470Ω		RC25A471K	BTS-470	
R66	33Ω		RC25A330K	BTS-33	
R67	47KΩ		RC23A473K	BTS-47K	
R68	1 Meg		RC23A105M	BTS-1Meg	
R69	12KΩ		RC25A123K	BTS-12K	
R70	47KΩ		RC25A473K	BTS-47K	
R71	10Meg		RC23A106K	BTS-10Meg	
R72	10Ω		RC25A100K	BTS-10	
R73	390Ω		RC25A391K	BTS-390	
R74	1.2Meg-5%		RC25A125J	BTS-1.2Meg-5%	
R75	220KΩ-5%		RC25A224J	BTS-220K-5%	
R76	68KΩ		RC23A683K	BTS-68K	
R77	150Ω	1	RC24A151M	BTA-150	
R78	56KΩ	2	RC25A563K	BTS-56K	
R79	3900Ω	1	RC24A392K	BTA-3900	
R80	100KΩ	2	RC23A104K	BTS-100K	
R81	22KΩ		RC25A223K	BTS-22K	
R82	220KΩ		RC25A224K	BTS-220K	
R83	2.2Meg		RC23A225K	BTS-2.2Meg	
R84	470KΩ		RC25A474K	BTS-470K	

RESISTORS (CONT.)

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: BENDIX PART No.	IRC PART No.	NOTES
R85	2.2Meg		RC23A225K	BTS-2.2Meg	
R86	33KΩ		RC25A333K	BTS-33K	
R87	47KΩ		RC23A473K	BTS-47K	
R88	100KΩ		RC23A104K	BTS-100K	
R89	8200Ω		RC23A822K	BTS-8200	
R90	4700Ω		RC23A472K	BTS-4700	
R91	12KΩ		RC23A123K	BTS-12K	
R92	2700Ω		RC23A272K	BTS-2700	
R93	39KΩ		RC23A393K	BTS-39K	
R94	15KΩ		RC23A153K	BTS-15K	
R95	10KΩ		RC23A103K	BTS-10K	
R96	3300Ω		RC23A332K	BTS-3300	
R97	33KΩ		RC23A333K	BTS-33K	
R98	3300Ω		RC23A332K	BTS-3300Ω	
R99	33KΩ-5%		RC23A333J	BTS-33K-5%	
R100	68Ω		RC25A680K	BTS-68	
R101	2.2Meg		RC23A225K	BTS-2.2Meg	
R102	470KΩ		RC23A474K	BTS-470K	
R103	470KΩ		RC23A474K	BTS-470K	
R104	680KΩ		RC23A684K	BTS-680K	
R105	2200Ω	2	RC25A222M	BTS-2200	
R106	1000Ω			BTS-1000	
R107	1000Ω			BTS-1000	
R108	33KΩ	1	RC24A333K	BTA-33K	
R109	180KΩ	1	RC24A184K	BTA-180K	
R110	180KΩ		RC23A184K	BTS-180K	
R111	4.7Meg		RC23A475M	BTS-4.7Meg	
R112	470KΩ		RC23A474K	BTS-470K	
R113	39KΩ		RC23A393K	BTS-39K	
R114	1800Ω		RC23A182K	BTS-1800	
R115	5600Ω		RC24A562K	BTA-5600	
R116	68KΩ		RC23A683K	BTS-68K	
R117	330KΩ		RC23A334K	BTS-330K	
R118	22KΩ	2	RC25A223K	BTS-22K	
R119	5600Ω		RC23A562K	BTS-5600	
R120	10KΩ		RC23A103K	BTS-10K	
R121	470KΩ	1	RC24A474K	BTA-470K	
R122	100Ω		RC23A101K		
R123	100Ω	2	RC25A101M	BW-2-100	
R124	22KΩ	2	RC25A223K	BTS-22K	
R125	47KΩ	2	RC23A473K	BTS-47K	
R126	3.3Ω		268000-033		
R127	175Ω	7.5	268016-4		
R128	175Ω	7.5	268016-4		
R129	220KΩ	1	RC24A224K	BTA-220K	
R130	2.2Ω	2	268001-022		

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: BENDIX PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.
T1	117VAC @1.78A	725VCT .190ADC	5VAC @ 3A	6.3VAC @1.2A SEC. 4 6.3VAC @8.2A	265048-1	P-8170 ①		TP-360 ② ①	R-35A	

① Drill new mounting holes.
② Use universal mounting bracket.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI.	RATING: DC RESISTANCE SEC.	REPLACEMENT DATA: BENDIX PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.	NOTES
T2	439Ω@10, 9Ω@ 60	SEC. 2 0Ω	265086-1		HVO-9 ① ② ③				Horiz. Output Trans.
T3	880Ω	10Ω	265072-5	A-8112	A-3036	T9G-9	A-99X ④	2047Z ①	Vert. Output Trans.
T4A	22Ω		265077-1	D9-11A ⑤ ⑥	MDF-73 ⑤	TY-7 ⑤ ⑥	Y-19 ⑤ ⑥		Horiz. Deflection Coils
B	61Ω			④					Vert. Deflection Coils
T5	17Ω		259082-6		MWC-6		WC-12 ⑦	213R1	Horiz. Linearity Coil
T6	5.3Ω		259114-1		MWC-2 ⑦	TL-3 ⑦			Width Coil

① Drill new mounting holes.
② See instruction sheet packed with unit for terminal connections.
③ Use with width coil MWC-1.
④ Drill one new mounting hole.
⑤ Use original deflection coil network if necessary.
⑥ Use original deflection coil network.
⑦ Connect to coded blue and red terminals.
⑧ Do not use tap.
⑨ Enlarge mounting hole.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: BENDIX PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	NOTES
T7	5.7KΩ	3.2Ω	288Ω	.54Ω	265071-12	A-3877 ①	A-3930 ①	RO-9 ①	S-5X ①	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: BENDIX PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	6 1/8"	PM	3.2Ω	255004-2	ST-109 Mod. P6-W	6A21	

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA BENDIX PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	UHF Ant. Trans.	0Ω	0Ω					Sec. tapped
L2	UHF RF Coil	0Ω						Tapped
L3	Fil. Choke	0Ω						
L4	Fil. Choke	0Ω						
L5	Fil. Choke	0Ω						
L6	Fil. Choke	0Ω						
L7	UHF IF Output Coil	.1Ω						
L8	UHF Coil	0Ω						
L9	UHF Coil	0Ω						
L10	VHF Ant. Trans.	0Ω CT	0Ω CT					
L11	Ant. Coils	0Ω						
L12	Ant. Coil	0Ω						Channel 13
L13	Neutr. Coil	0Ω						
L14	Fil. Choke	0Ω						
L15	RF Coil	0Ω						Channel 13
L16	RF Coils	0Ω						
L17	Mixer Grid Coil	0Ω						Channel 13
L18	Mixer Grid Coils	0Ω						
L19	Osc. Plate Coil	0Ω CT						Channel 13
L20	Osc. Coils	0Ω						
L21	Osc. Coil	0Ω						Channel 6
L22	Conv. Plate	.1Ω						
L23	Fil. Choke	0Ω						
L24	1st. Video IF	0Ω		259138-1				Includes trap & 1.5MMF Capacitor
L25	Accompanying Sound Trap	0Ω		259146-1				Bendix part no. includes C45, and C46
L26	2nd. Video IF	0Ω	.1Ω	259144-1	17-4522		6219	
L27	3rd. Video IF	.1Ω	.1Ω	259145-1	17-4523		6219	
L28	Adj. Channel Picture Trap	0Ω		259147-1				Bendix part no. includes C51 and C52
L29	4th. Video IF	.1Ω		259148-1				
L30	Fil. Choke	0Ω		259149-1			4604	1.5 Microhenries
L31	Series Peaking Coil	14Ω		259105-7	19-4250	TV-187	6173	270 Microhenries, wound on 22KΩ resistor
L32	Shunt Peaking Coil	14Ω		259105-4	19-3250	TV-185	6181	270 Microhenries
L33	4.5MC Trap	.8Ω		259108-1	20-1004	TV-151	1470	Bendix part no. includes C62
L34	2nd. Sound IF	2.8Ω		259136-2	20-1005	TV-151	1469	
L35	Ratio Det.	6.3Ω	.4Ω CT	259115-2	17-3493	TV-115 *	6205 *	Tertiary Winding -.5Ω
L36	Horiz. Osc.	49Ω		259121-1	19-1576	TV-163	6210	
L37	RF Choke	1.2Ω						Part of Horiz. Output Trans., part #265086-1

* Use adaptor plate.

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA BENDIX PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.
L38	.150ADC	155Ω	4 Hy.	265047-3 ①	C-2309 ②			

① Not used on all Models.
② Drill one new mounting hole.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA BENDIX PART No. FUSE	BENDIX PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M1	3AG P/T (Slo-Blo)	2/10A ⓐ 250V	26616-5201		315.200		MDV-2/10	

MISCELLANEOUS

ITEM No.	PART NAME	BENDIX PART No.	NOTES
M2	Pilot Lamp		Type #44 (2 Used)
M3	RF Tuner	258050-1	
M4	UHF Tuner	258051-1	
M5	Video Detector Assy.	259142-1	(Includes 5th. Video IF Trans., 1st. Sound IF trans., 3.3MMF Cap., 1.8MMF Cap., 4.7KΩ resistor, 1 Shunt & 1 Series peaking Coil, crystal diode 1N60)
M6	Switch		TV-Phono Selector
M7	Focus Magnet	274261-1	(Includes Centering lever)
M8	Ion Trap	274197-11	
M9	Correction Magnet	251222-2	
B2	Trimmer Capacitor	260009-11	Horiz. Drive 80-480MMF
	Cabinet	255131-1	Model HM21CU
	Cabinet	255132-1	Model HB21CU
	Cabinet	255133-1	Model FM21CU
	Cabinet	255130-1	Model KM21CU
	Cabinet	255130-2	Model KB21CU
	Cabinet	255129-1	Model TM21CU
	Cabinet	255129-2	Model TB21CU
	Cabinet	255133-2	Model FB21CU
	Cabinet Back Cover	251212-5	Models FM21CU, FB21CU
	Cabinet Back Cover	251212-4	Models HM21CU, HB21CU, KM21CU, KB21CU, TM21CU, TB21CU
	Safety Glass	257530-17	
	Mask	269068-3	
	Knob	269076-1	Brightness
	Knob	269077-3	Contrast
	Knob	269078-1	Fine Tuning
	Knob	269080-1	Horiz. Hold, Off/On Volume
	Knob	269087-2	Channel Selector
	Dial	257640	UHF Selector

TROUBLE SHOOTING AIDS (CONT.)

AUDIO

WEAK OR NO SOUND

Substitute V11, V12, V13, V14 and V15. Check stages of V14 and V15 by shorting pin 1 of V14 to ground. A loud noise should result.

If Satisfactory	If Unsatisfactory
Check alignment of ratio detector and audio IF stages, A10, A11, A12 and A13.	Check components associated with V14 and V15 especially T7, speaker, R74, R75 and R79.

BUZZ

Check setting of local oscillator. Readjust ratio detector. If buzz is still objectionable substitute V13 and readjust A12 and A13. Check C4 for leakage.

DISTORTED

Check stages of V14 and V15 using audio signal generator.

If Distorted	If Undistorted
Check components associated with stages of V14 and V15.	Check ratio detector and audio IF alignment. Check associated circuit components.

POWER

SMALL AND/OR DIM RASTER

Substitute V25. Measure B+.

If Low	If Satisfactory
Check C1A, C1B, C2A and other components of the B+ filter network.	Proceed as outlined under "INSUFFICIENT HIGH VOLTAGE".

DIM PICTURE WEAK SOUND

Substitute V25. Proceed as outlined under "SMALL AND/OR DIM RASTER".

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Substitute V21, V22, V23 and V24. Check fuse M1. Check waveform at W17.

If Satisfactory	If Unsatisfactory
Check C112, R126, T2 and other components associated with V22, V23 and V24. Check picture tube.	Check C106, C107, R117, R118, R125 and other components associated with V21 and V22.

INSUFFICIENT HIGH VOLTAGE

Substitute V21, V22, V23, V24 and V25. Proceed as outlined under "LOSS OF HIGH VOLTAGE".

BLOOMING

Substitute V24, V23, and V22. Check C112, R126, T2 and other associated components. Check picture tube.

GENERAL

RASTER NO SOUND NO PICTURE

Substitute V3, V4, V5, V6, V7, V8 and V15. V15 is used as voltage dividing network which supplies B+ to the entire video IF strip. Failure of V15 results in loss of sound and picture.

RASTER SOUND NO PICTURE

Substitute V9. Check coupling network between V9 and picture tube.

TOTAL LOSS OF SYNC

Substitute V16, V17 and V18. Check associated circuit components.

POOR FOCUS

Check focus adjustment on focalizer unit. Check potentials applied to picture tube. If correct, check picture tube.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing. Notice particularly around the horizontal transformer windings and high voltage rectifier tube socket.

DEAD SET

Check AC interlock assembly. Check switch on volume control. Check power transformer T1.

Symptoms shown above are assumed and are not indicative of the quality and workmanship of this receiving equipment.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the RF Tuner Oscillator Circuit may be accomplished by removal of the Channel Selector and Fine Tuning knobs. The adjustments are accessible, one at a time, through the small hole in the cabinet to the right of the Channel Selector shaft.

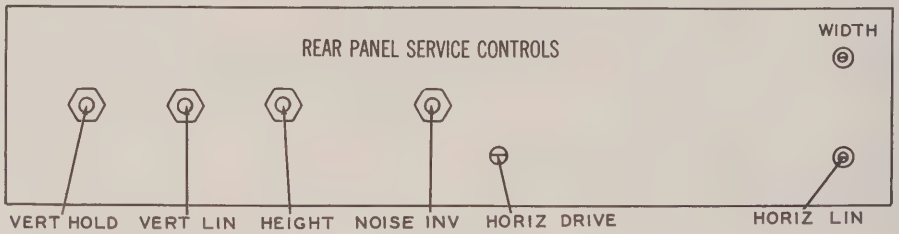
PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass remove four wood screws holding metal strip at bottom of cabinet. Remove metal strip, to remove safety glass pull out at bottom and down. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION



SPECIAL ADJUSTMENTS-NOISE INVERTER CONTROL ADJUSTMENT

The noise inverter control is factory adjusted for optimum performance. If it becomes necessary to adjust same tune in the strongest TV signal available. Turn the contrast control fully clockwise. Starting at maximum counter-clockwise position, turn the noise inverter control clockwise until a slight horizontal shift of the picture is noted then back off 1/8 turn.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the Horiz. Oscillator, it is necessary to remove the rear cover and supply power to set. Adjustment is located on top of chassis. Set the Horiz. Hold Control at the center of its range and adjust the Horiz. Osc. slug, L36, until picture synchronizes horizontally. (For location see tube placement chart).

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate Sound IF Detector Buzz, adjust the Ratio Detector Secondary, L35, located on top of chassis. (See tube placement chart).

FUSES

One fuse is used for Horiz. Sweep Circuit protection. (For location, see tube placement chart).

CENTERING

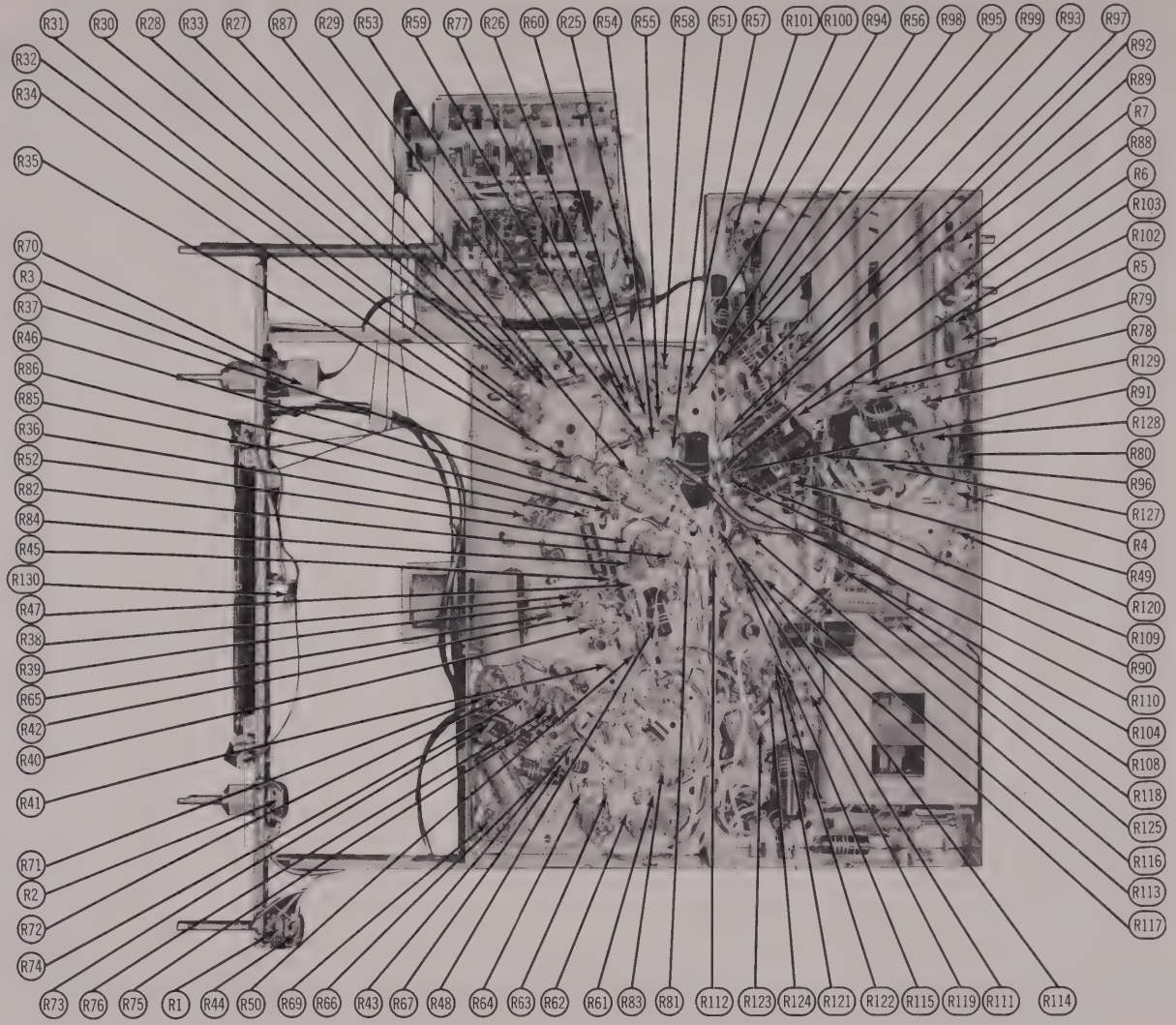
Centering is accomplished mechanically by means of a centering lever on the P.M. Focusing assembly. Adjust the centering lever from side to side, and up and down until the picture is properly centered.

ANTI-PIN CUSHION CORRECTION

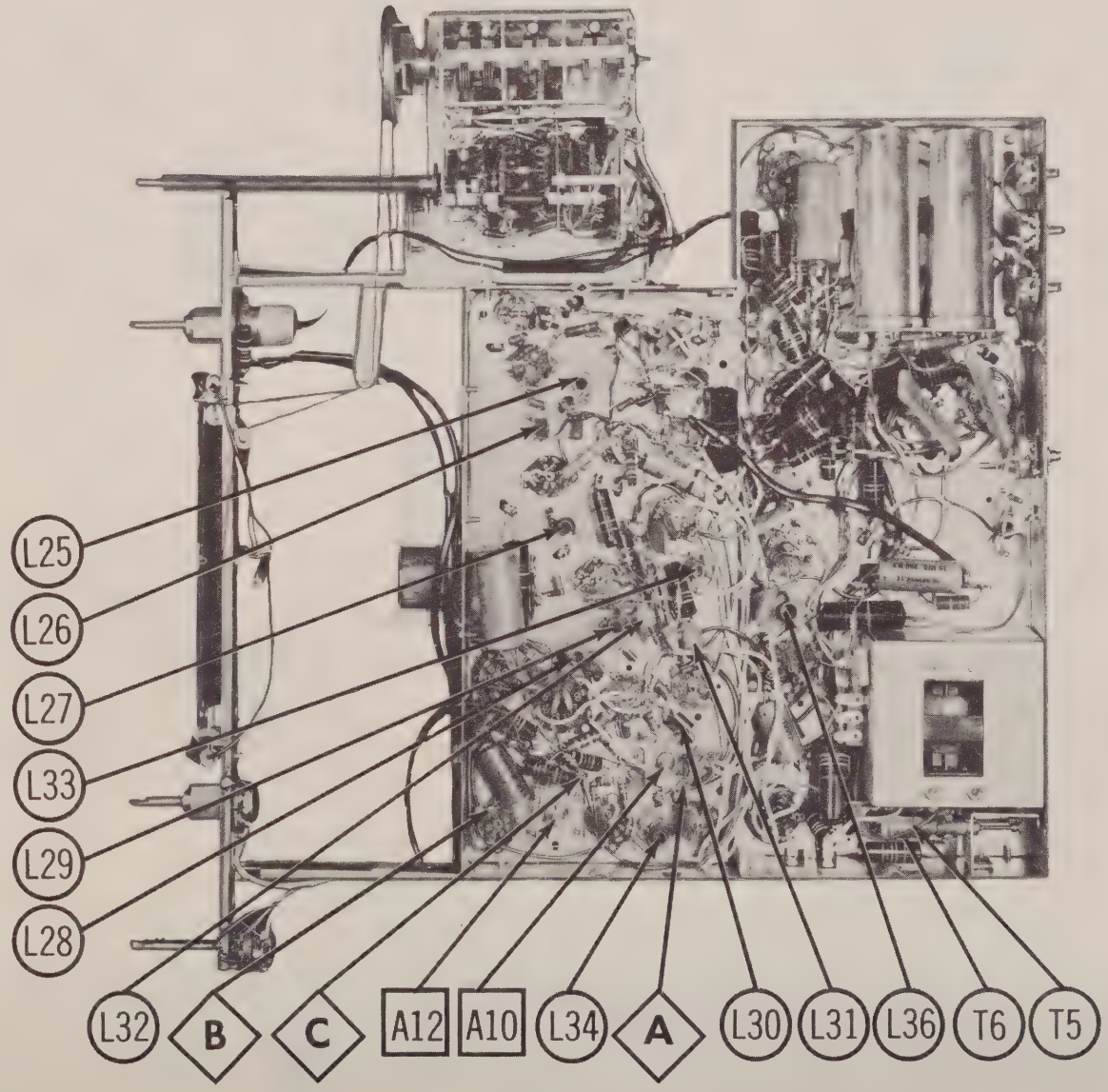
Move the raster slightly off center until the side of the picture to be straightened can be seen. The double hinge on the mounting brackets permits the anti-pin cushioning magnets to be moved either forward or backward to the point where minimum pin cushioning is obtained.

DISASSEMBLY INSTRUCTIONS

1. Remove 6 push on type control knobs from front panel.
2. Remove 10 wood screws. Remove rear cover.
3. Disconnect built-in antenna. Remove 2 wood screws. Remove antenna bracket.
4. Remove 1 wood screw. Remove TV phono switch.
5. Disconnect speaker, yoke plug, crt. socket, HV lead & ground lead from HV cage.
6. Remove 5 chassis bolts. Remove chassis.
7. Remove 2 speaker nuts. Remove speaker.



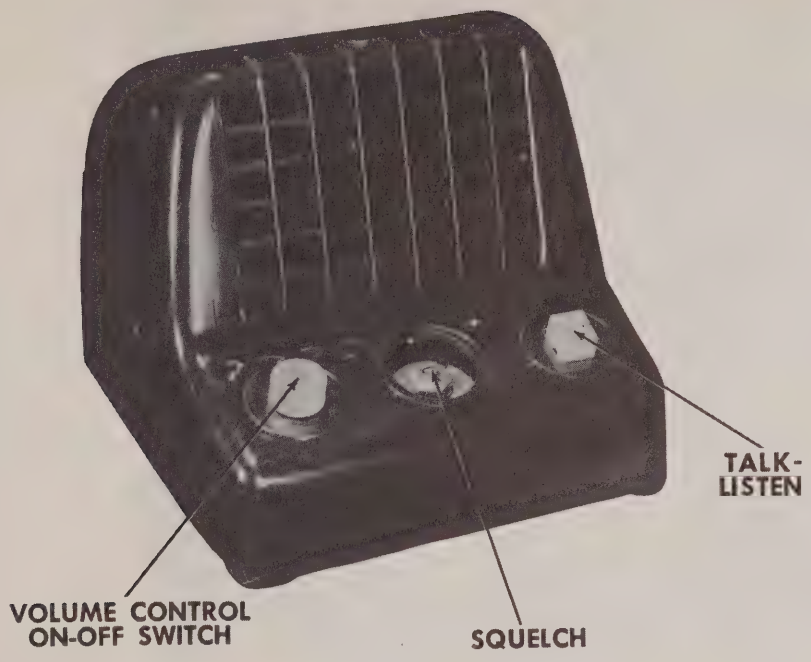
CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

PROPERTY OF
L. F. BLANKENSHIP
39[illegible] ST.
DENVER, COLORADO

DAVID BOGEN
MODEL "Twin"



DAVID BOGEN
MODEL "Twin"

TRADE NAME	David Bogen Model "Twin".
MANUFACTURER	David Bogen Co., Inc., 29 Ninth Ave., New York, 14, N.Y.
TYPE SET	AC-DC Operated Two Station Wireless Intercommunication System
TUBES (Three)	Types 50B5 Osc.-Det., 12AY7 AF Amp., 50B5 Audio Output
POWER SUPPLY	110-120 Volts AC-DC RATING .22 Amp @ 117 Volts AC
TUNING RANGE-	160-196KC

ALIGNMENT

Alignment is made to any frequency between 160KC and 196KC, selected to insure operation with a minimum of interference.
Connect a signal generator between the common negative terminal and the external ground lead. Set the generator to the chosen frequency (between 160KC and 196KC), modulated 30%.
Adjust the slug, A1, for maximum output.
Repeat above procedure for each unit in the system.

SQUELCH ADJUSTMENT

To adjust the squelch circuit, proceed as follows:

1. Pry the large plug button off the front of the cabinet with a screw driver.
2. Have someone count slowly into one unit while the following adjustment are made at the other unit.
3. With a screwdriver, rotate the control in a clockwise direction until the sound just ceases. Now slowly rotate the control in the reverse direction until the received signal is crisp and undistorted.
4. Replace plug button.
5. Repeat steps 1, 2, 3,and 4 for the other unit.

TWO WIRE-THREE WIRE SWITCH

The switch located at the rear of each unit of the "Twin" is used to select either a two-wire or a three-wire method of connection to the power line.
The three-wire connection will provide stronger signals with less noise over a given distance and should be used whenever possible, particularly if the stations are located at some distance from each other.
The two-wire connection provides sufficient output when the stations are fairly close, for example, in different rooms of a home. Since the grounding lug previously mentioned is not required for the two-wire system, the units can be moved from room to room and placed in operation simply by plugging into the wall outlet. The increased line noise and hum which may result in some case from the use of the two-wire connection can be reduced by reversing the power cord in the outlet.
In some localities where the power lines are not grounded the two-wire system must be used. In case of doubt, the local power company can supply information about their lines. Regardless of which type of connection is used, it is important that the switch of each unit of the "Twin" be placed in the same position.

OPERATION

To call the other station, depress the push-to-talk button and speak in a normal tone of voice. To receive, release the button.
When it is necessary to listen for sounds originating from a given place, the "Twin" may be employed as a Silent Watchman. Depress the push-to-talk button of the unit as far as it will go and apply a slight pressure to the left. This will lock the unit in the "transmit" position. A slight pressure to the right will release the button. Place the unit in locked position at the locality to be guarded. Sound originating in its vicinity will be heard at the other station.
The design of the "Twin" will permit operation of two independent communications systems using the same power line. To prevent interference, the two systems should be aligned at frequencies as far apart as possible. System "A", for example, should be tuned to 160 kilocycles, and sytems "B" to 196 kilocycles. To further reduce the possibility of interference, or system should be operated with a separate common wire acting as the ground. This wire should run to each station of the system, and have connected to it only the grounding lug of each unit. Do not ground this wire, or connect anything else to it. In this way, both systems can be operated with the three-wire connection, If it is not practicable to furnish a common wire, one system should be operated using the two-wire connection.

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

DAVID BOGEN
MODEL "Twin"

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RTMA BASE TYPE	INSTALLATION NOTES
		David-Bogen PART No.	STANDARD REPLACEMENT		
V1	Oscillator-Detector	50B5	50B5	7BZ	
V2	AF Amplifier	12AX7	12AX7	9A	
V3	Audio Output	50B5	50B5	7BZ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	David Bogen PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1A	■40	150		AFH3-09		C008				
B	▲30	150								
C	10	150								
C2	.1	400		P488-1	DF-104	PTE4P1		PT401	4TM-P1	
C3	150	500		1469-00015		5R5T15		MCB236		
C4	47			SI47	D6-470	TM5Q5	GP1K-470	UC-5447	5GA-Q47	Note 1
C5	47			SI47	D6-470	TM5Q5	GP1K-470	UC-5447	5GA-Q47	Note 1
C6	150	500		1468-00015	D6-151	5W5T15	GP2K-151	MC236	1FM-325	
C7	500	500		1468-0005	D6-501	5W5T5	GP2K-501	MC245	1FM-35	
C8	1000			SI1000	D6-102	TM5D1	GP2L-102	UC-521	5HK-D1	
C9	.02	600		P688-02	DF-203	PTE6S2		PT612	6TM-S2	
C10	250	500		1468-00025	D6-251	5W5T25	GP2K-251	MC240	1FM-325	
C11	10000			BPD-01	DD-103	TM5S1	811-01	DC-511	5HK-S1	
C12	10000			BPD-01	DD-103	TM5S1	811-01	DC-511	5HK-S1	
C13	.1	400		P488-1	DF-104	PTE4P1		PT401	4TM-P1	
C14	.1	400		P488-1		PTE4P1		PT401	4TM-P1	
C15	.1	400		P488-1		PTE4P1		PT401	4TM-P1	

Note 1. Some Models combine C4, C5 and R3 in one unit.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	David-Bogen PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	500KΩ	½	V149-A	Q13-133	AG-60-Z	B-60-S	U-48	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWB	Not Req.	US-26	Attach to R1A
R2A	500KΩ	½	V275-A	Q13-133	AG-60-Z	AB-60	U-48	Squelch
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Not Req.	Attach to R2A

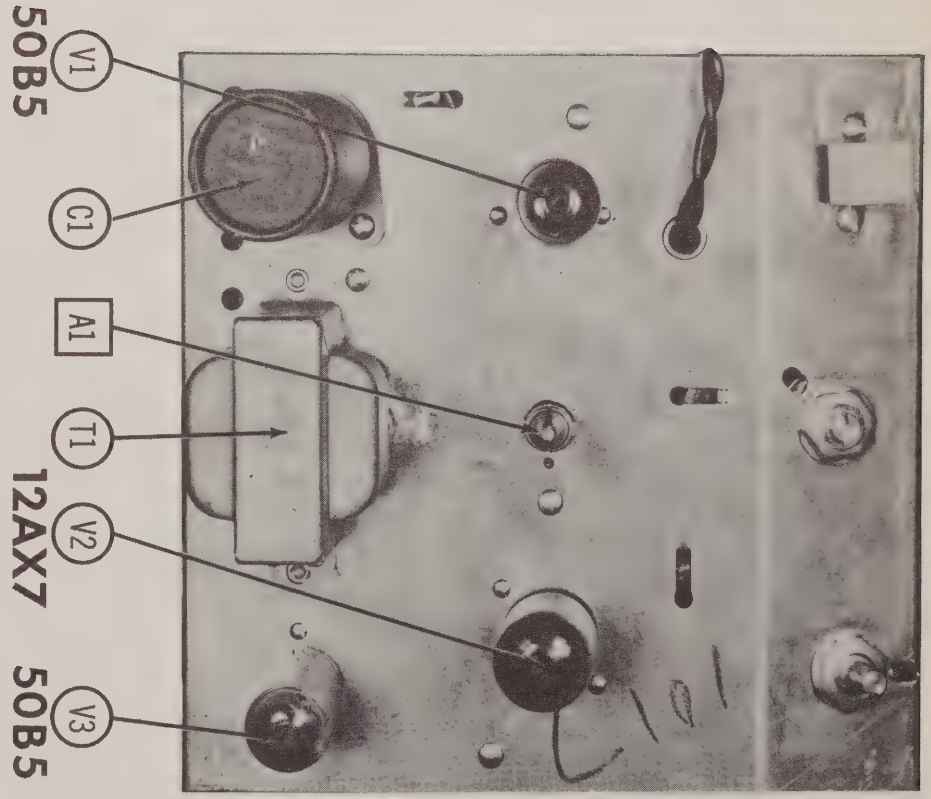
RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	David-Bogen PART No.	IRC PART No.	
R3	47KΩ	½		BTS-47K	Note 2
R4	100KΩ	½		BTS-100K	
R5	47KΩ	½		BTS-47K	
R6	33KΩ	½		BTS-33K	
R7	1000Ω	½		BTS-1000	
R8	270KΩ	½		BTS-270K	Note 1
R9	1 Meg	½		BTS-1 Meg	
R10	4.7Meg	½		BTS-4.7Meg	
R11	10KΩ	½		BTS-10K	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	David-Bogen PART No.	IRC PART No.	
R12	270KΩ	½		BTS-270K	Note 1
R13	39KΩ	½		BTS-39K	
R14	3300Ω	1		BTA-3300	
R15	470KΩ	½		BTS-470K	
R16	150Ω	1		BTA-150	
R17	100Ω	1			
R18	100Ω	½		BTS-100	

Note 1. Some models may use a 220KΩ resistor in this application.
Note 2. Some models combine R3, C4 and C5 in one unit.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA					NOTES
	IMPEDANCE		DC RES.		David-Bogen PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	
	PRI.	SEC.	PRI.	SEC.						
T1	2.4KΩ	48Ω	107Ω	4.2Ω	T275-2					

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	David-Bogen PART No.	JENSEN PART No.	QUAM PART No.	
SP1	3½"	PM	48Ω	3AM-13		3A07Z48	

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	David-Bogen PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Osc. Coil	17Ω	50Ω	U-305				Coupling winding. 3Ω

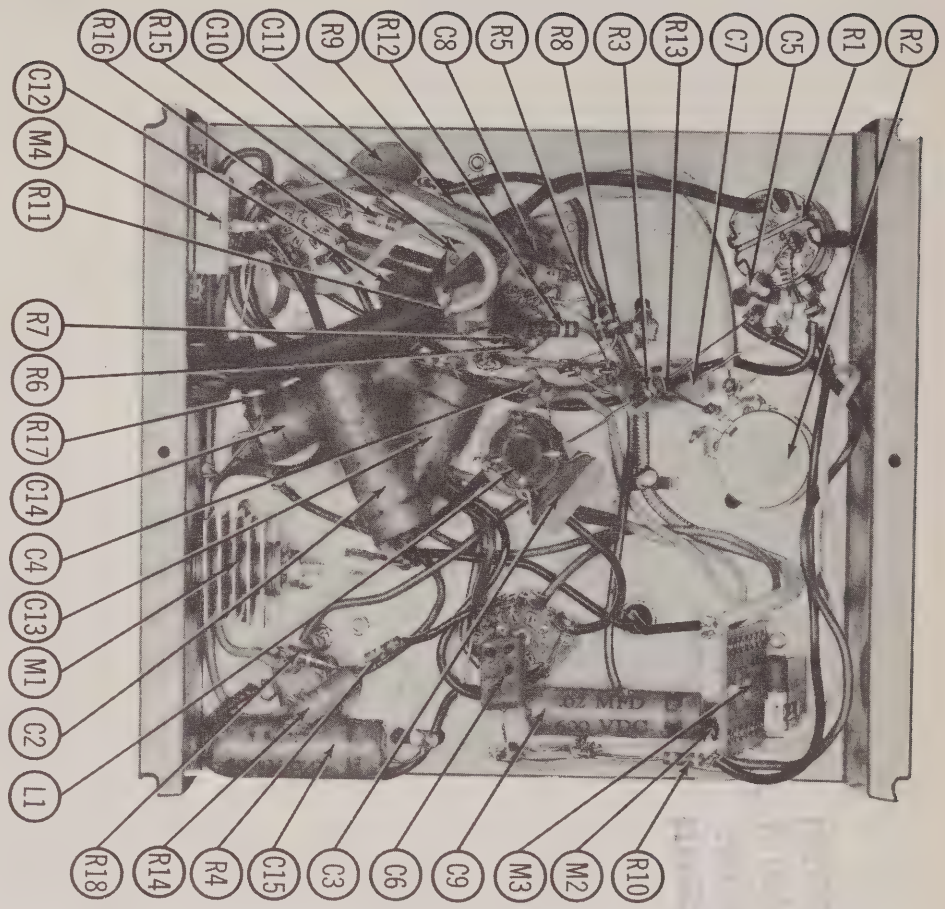
SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA					
	CURRENT	David-Bogen PART No.	SYLVANIA PART No.	SELETRON PART No.	FEDERAL PART No.	MALLORY PART No.	SARKES TARZIAN PART No.
M1	.043A	H243	NC5	5M1	1101A	6S100A	100

MISCELLANEOUS

ITEM No.	PART NAME	David-Bogen PART No.	NOTES
M2	Crystal Diode		Squelch Rectifier(1N51)
M3	Switch	S374B	Talk-Listen
M4	Switch	S379	Line (Transmission) Selector

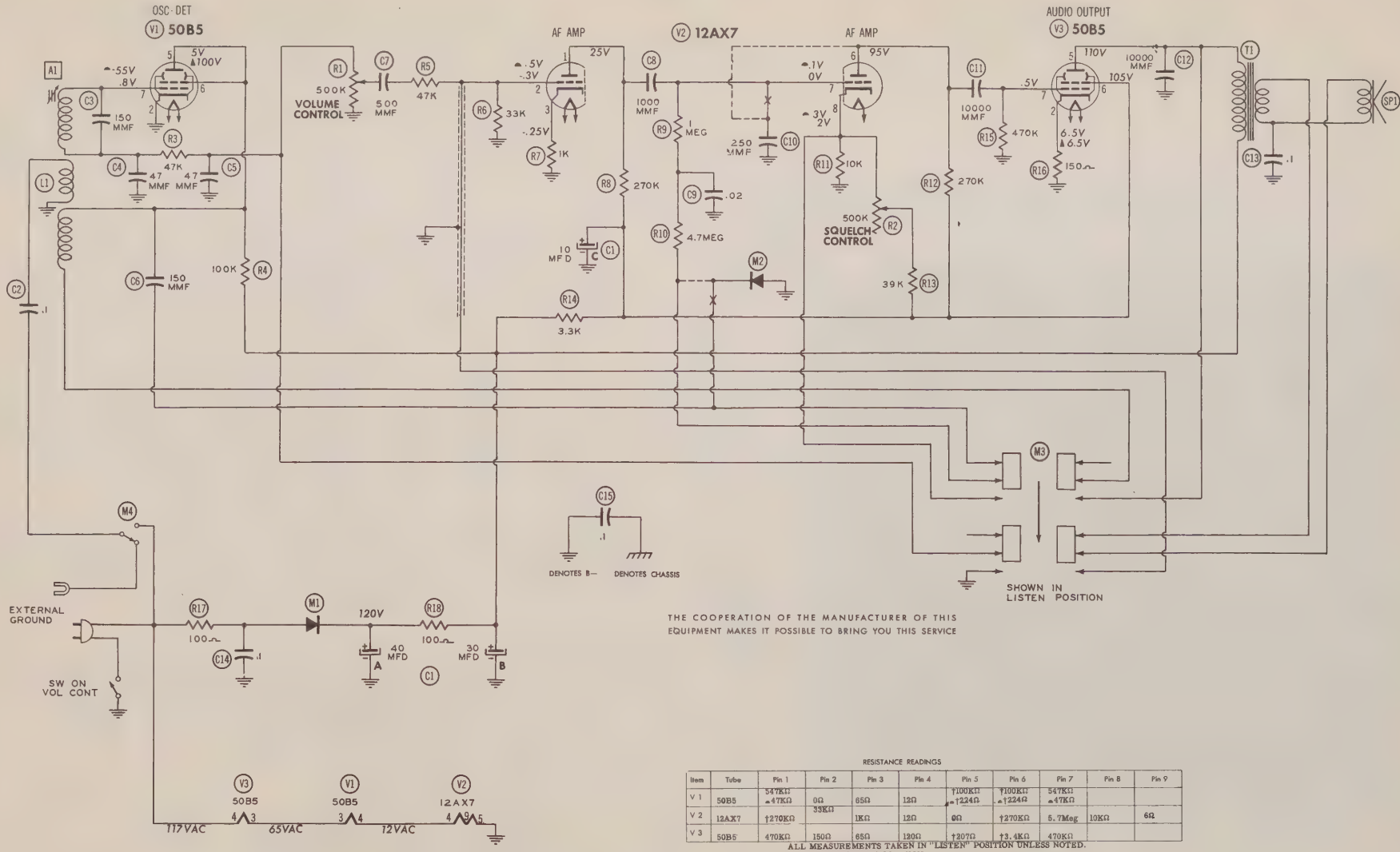
CHASSIS—BOTTOM VIEW



SET 213 FOLDER 3

DAVID BOGEN MODEL "Twin"

DAVID BOGEN MODEL "Twin"



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RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	50B5	547KΩ ▲47KΩ	0Ω	65Ω	12Ω	†100KΩ ▲†224Ω	†100KΩ ▲†224Ω	547KΩ ▲47KΩ		
V 2	12AX7	†270KΩ	33KΩ	1KΩ	12Ω	0Ω	†270KΩ	5.7Meg	10KΩ	6Ω
V 3	50B5	470KΩ	150Ω	65Ω	120Ω	†207Ω	†3.4KΩ	470KΩ		

ALL MEASUREMENTS TAKEN IN "LISTEN" POSITION UNLESS NOTED.
▲ TAKEN IN "TALK" POSITION.
† MEASURED FROM M1

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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1000 per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

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MODEL 2921

PACKARD-BELL
MODELS 2921, 2922

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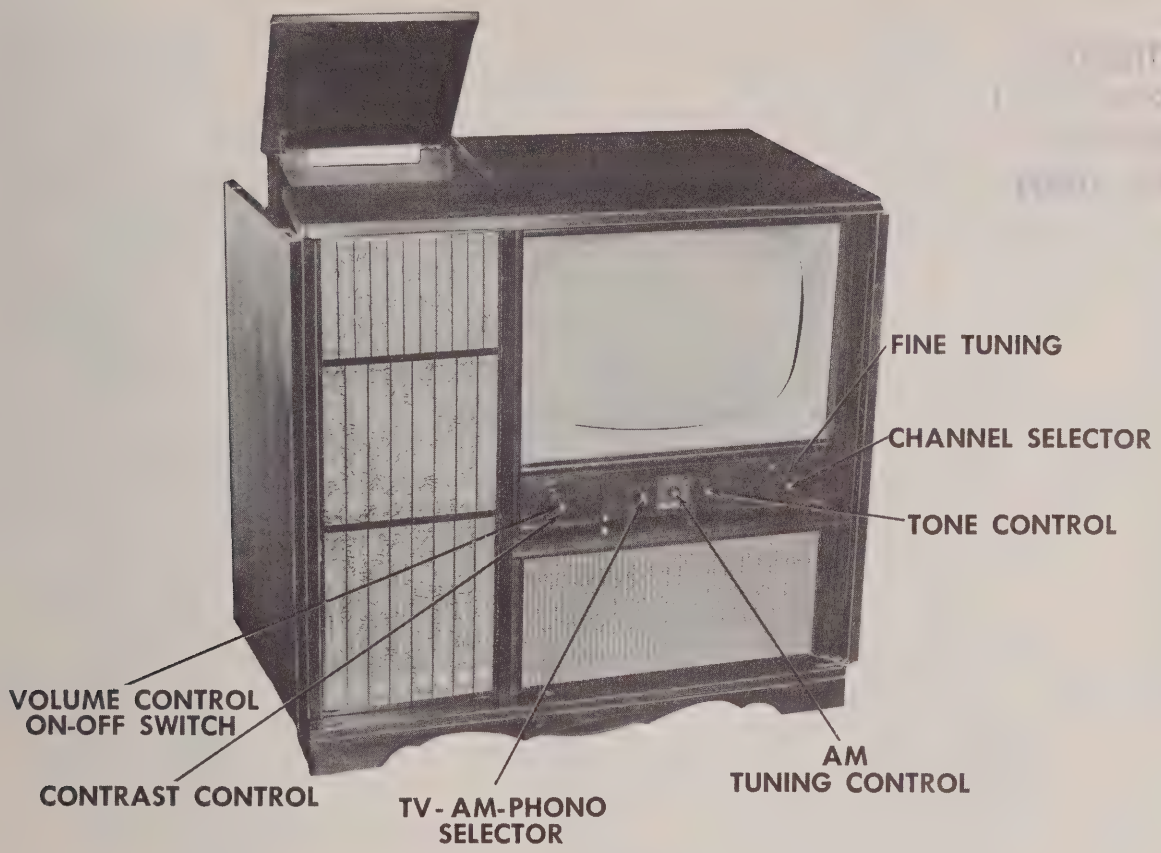

PACKARD-BELL
MODELS 2921, 2922

PACKARD-BELL MODEL 2921

TRADE NAME	Packard-Bell Models 2921, 2922
MANUFACTURER	Packard-Bell Co., Service Div., 11th. & Hope Sts., Los Angeles, California
TYPE SET	TV-AM-Phono Combination
TUBES	Twenty-nine
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING 1.76 AM
TUNING RANGE	Channels 2 thru 13, Video IF 25MC, Sound IF 20.5MC (Intercarrier), AM Radio 540-1620KC, AM IF 455KC

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FOR SERVICE INFORMATION ON RECORD CHANGER, SEE V-M MODEL 950, PHOTOFACT SET 107, FOLDER 13, ALSO, SUPPLEMENT SET 131, FOLDER 17, OR RECORD CHANGER MANUAL CM-3.

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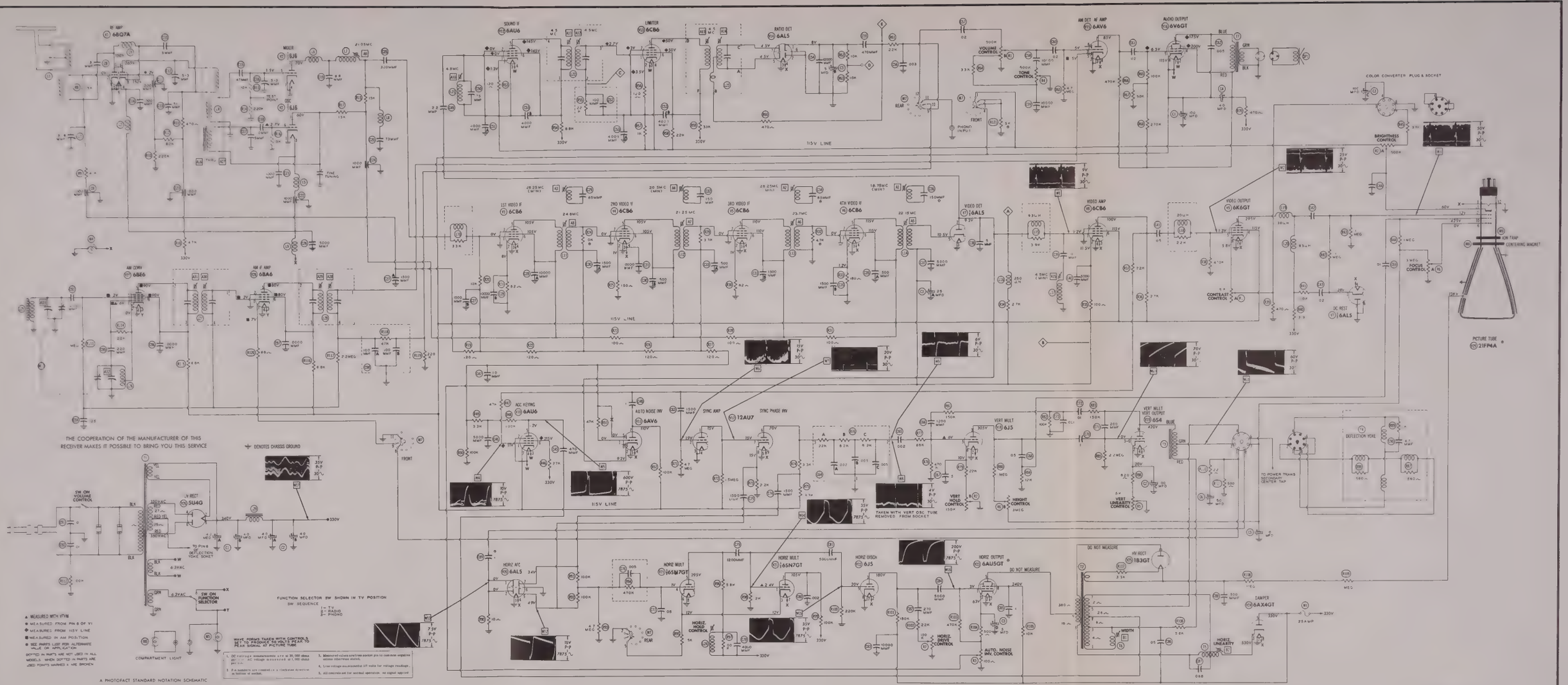
RF AMP V2 6BQ7A
MIXER V3 6BJ6
OSC V4 6BJ6
SOUND IF V12 6AU6
LIMITER V13 6CB6
RATIO DET V14 6AL5
AM DET AF AMP V11 6AV6
AUDIO OUTPUT V11 6V6GT
VOLUME CONTROL
TONE CONTROL
PHONO INPUT
COLOR CONVERTER PLUG & SOCKET
BRIGHTNESS CONTROL
ION TRAP CENTERING MAGNET
PICTURE TUBE V21 21FP4A
1ST VIDEO IF V1 6CB6
2ND VIDEO IF V4 6CB6
3RD VIDEO IF V5 6CB6
4TH VIDEO IF V6 6CB6
VIDEO DET V7 6AL5
VIDEO AMP V8 6CB6
VIDEO OUTPUT V9 6K6GT
CONTRAST CONTROL
DC REST V7 6AL5
FOCUS CONTROL
AM OSC V7 6BE6
AM IF AMP V10 6BA6
AGC KEYING V10 6AU6
AUTO NOISE INV V11 6AV6
SYNC AMP V11 12AU7
SYNC PHASE INV
VERT MULT V14 6J5
VERT MULT VERT OUTPUT V9 6S4
HEIGHT CONTROL
VERT HOLD CONTROL
VERT LINEARITY CONTROL
DEFLECTION YOKE
TO POWER TRANS SECONDARY CENTER TAP
HORIZ AFC V5 6AL5
HORIZ MULT V7 16SN7GT
HORIZ MULT V2 16SN7GT
HORIZ OSCH V12 6J5
HORIZ OUTPUT V3 6AU5GT
DO NOT MEASURE
HV RECT V13 1B3GT
DAMPER V14 6AX4GT
HORIZ HOLD CONTROL
HORIZ DRIVE CONTROL
AUTO. NOISE INV. CONTROL
WIDTH
HORIZ LINEARITY
115V LINE
REAR
FRONT
PHONO INPUT
TEST POINT
FINE TUNING
SW ON VOLUME CONTROL
V RECT V5 5U4G
SW ON FUNCTION SELECTOR
COMPARTMENT LIGHT
TO PINS 6 OF DEFLECTION YOKE SOCKET
TAKEN WITH VERT OSC TUBE REMOVED FROM SOCKET
DENOTES CHASSIS GROUND
FUNCTION SELECTOR SW SHOWN IN TV POSITION
SW SEQUENCE
1- TV
2- RADIO
3- PHONO
WAVE FORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK TO PEAK SIGNAL AT PICTURE TUBE
▲ MEASURED WITH VTVM
● MEASURED FROM PIN 6 OF V1
◆ MEASURED FROM 115V LINE
■ MEASURED IN AM POSITION
✱ RED PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DOTTED IN PARTS ARE NOT USED IN ALL MODELS. WHEN DOTTED IN PARTS ARE USED POINTS MARKED ✱ ARE BROKEN
1. DC voltage measurements are to 20,000 ohms per volt. AC voltage measured at 1,000 ohms per volt.
2. P-A numbers are counted in a clockwise direction as bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation, no signal applied.
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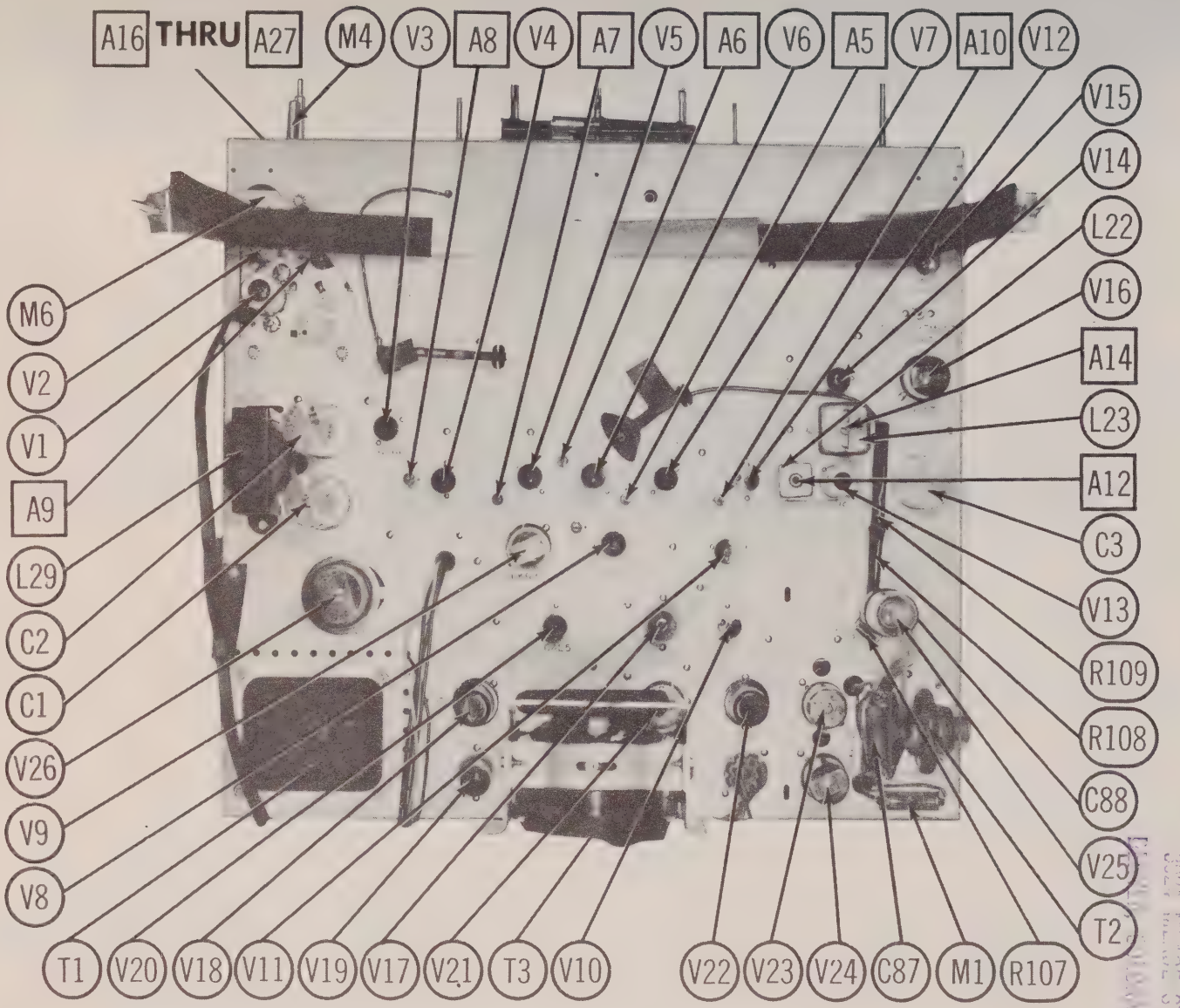

TV CHASSIS TOP VIEW

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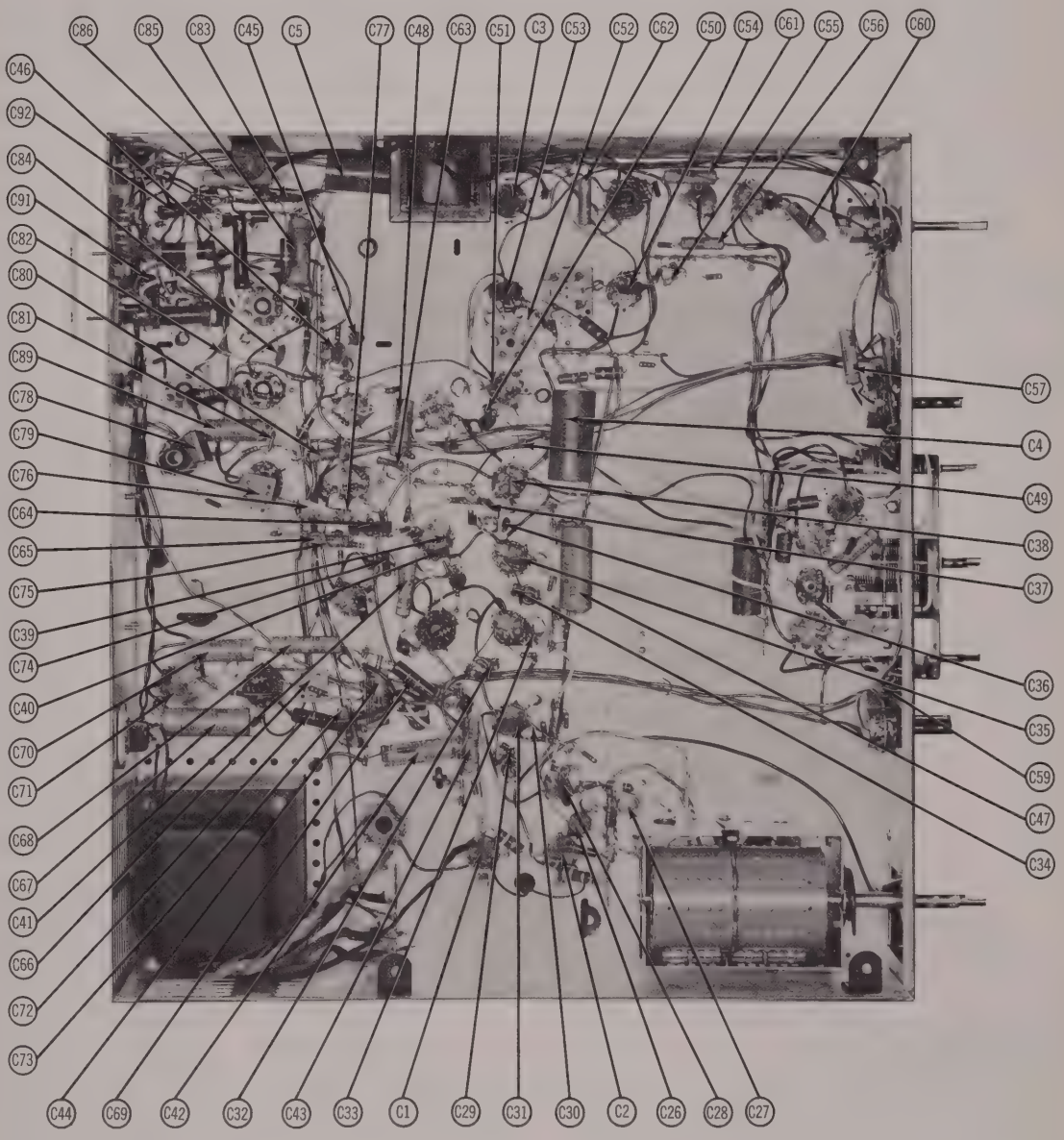
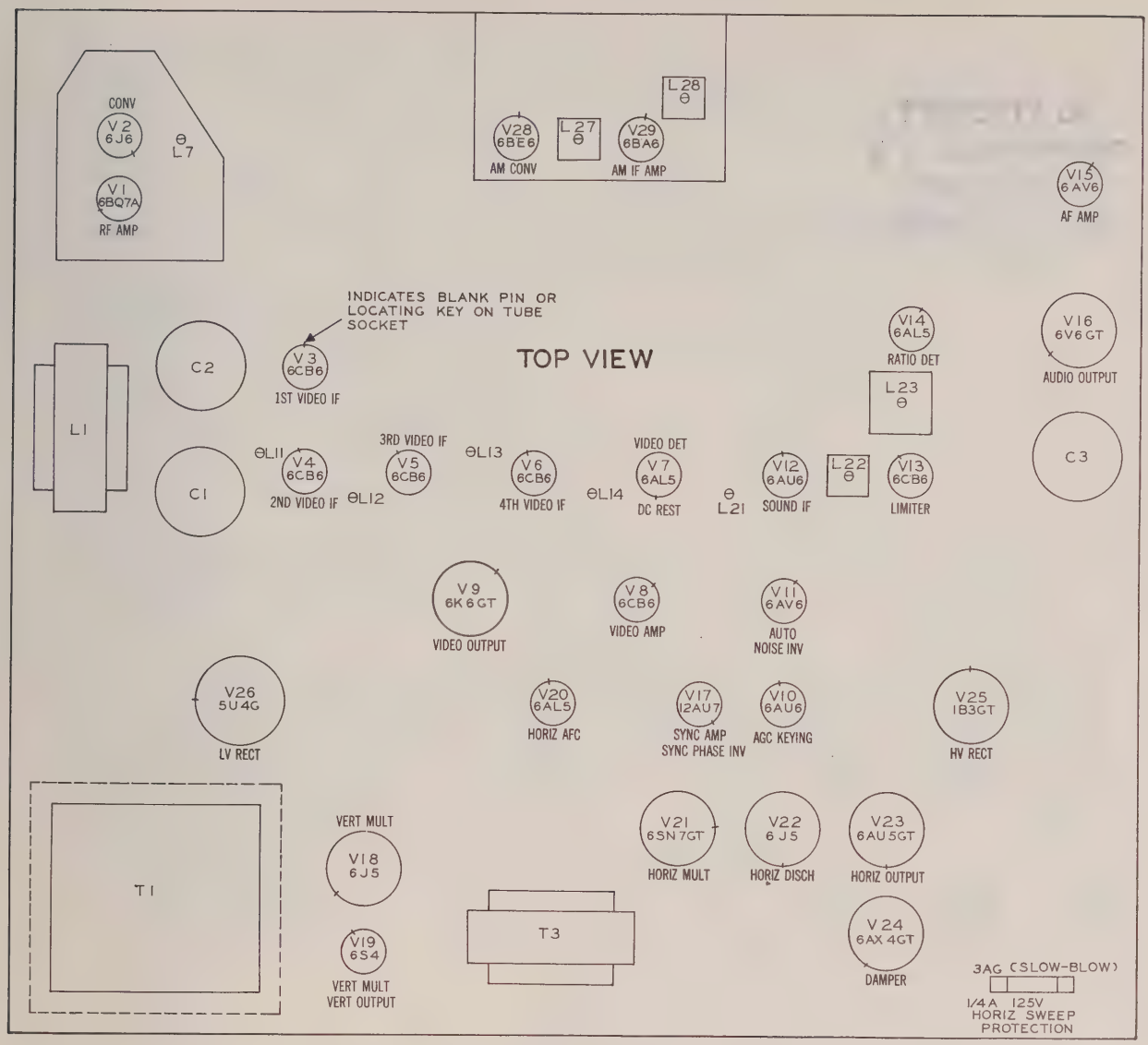


TV CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound -V26

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V6, V7, V16
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster - V8, V9, V29
Has pic, no sound - V12, V13, V14, V15, V16
Overloaded picture - V10

SYNC FAILURE
No vert. sync - V17, V18, V19
No horiz. sync - V17, V20, V21
No vert. or horiz. sync - V11, V17

SWEEP FAILURE
No raster, has sound - V21, V22, V23, V24, V25, V29 Fuse (M1)
No vertical deflection - V18, V19
Poor vert. linearity or foldover - V18, V19
Poor horiz. linearity or foldover - V21, V22, V23, V24
Narrow picture - V21, V22, V23, V24, V25, V26
Vert. off freq. - V17, V18, V19
Horiz. off freq. - V17, V20, V21

TV ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage shock hazard can be eliminated by removing the horizontal oscillator tube, V21.

VIDEO IF ALIGNMENT

Connect the negative lead of a 3 volt battery to the ungrounded side of C47. Connect the positive lead to chassis.
Early Models have traps on 1st. and 2nd. Video IFs only. The frequencies to which they should be aligned are indicated in the table by an asterisk (*).
Remove 6AV6 (V11) from its socket.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	.001MFD	High side to pin 1 (grid) of 6CB6 (V3). Low side to chassis.	18.75MC (Unmod)	Any non-interfering channel.	DC probe to point (A) Common to point (B)	A1	Adjust for MINIMUM deflection.
2.	"	"	26.25MC *26.5MC	"	"	A2, A3	Adjust A2 and A3 for MINIMUM deflection at 26.25MC. A2 does not appear in some models and in that case A3 will be adjusted for MINIMUM at 26.5MC.
3.	"	"	20.5MC *20.5MC	"	"	A4	Adjust for MINIMUM deflection.
4.	"	"	22.15MC	"	"	A5	Adjust for maximum deflection. Attenuate generator output to maintain 2.5 to 3 Volts of VTVM.
5.	"	"	23.7MC	"	"	A6	"
6.	"	"	21.25MC	"	"	A7	"
7.	"	"	24.8MC	"	"	A8	"
	Repeat steps 1 thru 7.						
8.	Direct	High side to an ungrounded tube shield floating over converter tube. Low side to chassis.	21.05MC	Any non-interfering channel.	DC probe to point (A) Common to point (B)	A9	Adjust for maximum deflection.

OVERALL VIDEO IF RESPONSE CHECK

Remove the bias battery.
Connect a 5MFD, 50 volt electrolytic capacitor across C46 with positive terminal to chassis.
There should be no drop in AGC voltage when the capacitor is connected. If drop is noted check capacitor for leakage.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	63MC (10MC Swp)	18.75MC 20.5MC 21.55MC 25.0MC 26.25MC	3	Vert. amp thru 22KΩ to point (A) Low side to chassis.		Check for response curve similar to Fig.1. If necessary retouch A5 thru A9 for desired response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	.001MFD	High side to point (A) Low side to chassis.	4.5MC (Unmod)	Any non interfering channel.	DC probe to point (C) Common to chassis.	A10, A11, A12	Adjust for maximum deflection.
11.	"	"	"	"	DC probe to point (D) Common to chassis.	A13	"
12.	"	"	"	"	DC probe to point (E) Common to point (D)	A14	Adjust for zero reading. A positive and negative reading will obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	.001 MFD	High side to point (A) Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any non interfering channel.	Vert. amp to point (C) Low side to chassis.	A10, A11, A12	Adjust for curve of maximum amplitude and symmetry as in Fig. 2.
11.	"	"	"	"	"	Vert. amp to point (D) Low side to chassis.	A13	Disconnect stabilizer capacity C3B. Adjust for curve of maximum amplitude and symmetry as in Fig. 2.
12.	"	"	"	"	"	Vert. amp thru 22KΩ to point (E) Low side to chassis.	A14	Reconnect capacitor C3B. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 3. SLIGHTLY retouch A13 for maximum amplitude and straightness of crossover lines.

4.5MC TRAP ALIGNMENT

Remove 6AL5 (V7) from its socket.
Set contrast control to maximum.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
13.	.001MFD	High side to point (A) Low side to chassis.	4.5MC (Unmod)	Any	DC probe thru detector (Fig. 4) to pin 2(grid) of picture tube. Low side to chassis.	A15	Adjust for MINIMUM deflection.

TV ALIGNMENT INSTRUCTIONS (CONT.)

OSCILLATOR ALIGNMENT

Replace 6AL5 (V7) in its socket.
Connect 5MFD, 50 volt electrolytic capacitor as under Video IF response check.
The channel oscillator adjustment screws are reached through a hole just to the right of the channel switch shaft. The correct adjustment screw is accessible through this hole as the channel switch is rotated to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

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	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
14.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 22KΩ to point (A). Low side to chassis.	A16	Adjust to place sound marker in notch as in Fig. 5. Video marker should be at 50%.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A17	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A18	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A19	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A20	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A21	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A22	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A23	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A24	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A25	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A26	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A27	

THE RF AND MIXER PORTION OF THIS RECEIVER HAS BEEN PROPERLY ALIGNED AT THE FACTORY AND IS VERY STABLE. ALIGNMENT OF THIS PORTION SHOULD NOT BE REQUIRED IN THE FIELD.

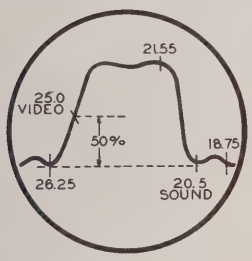


FIG.1

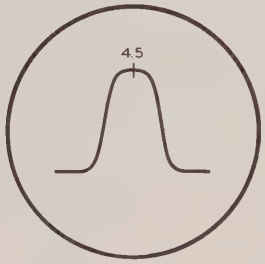


FIG. 2

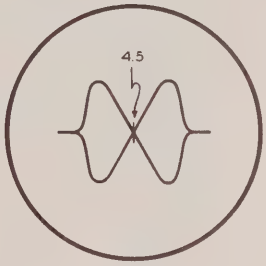


FIG. 3

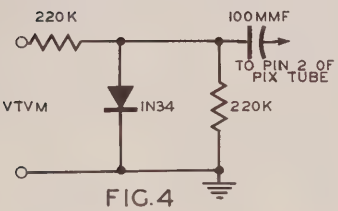


FIG.4

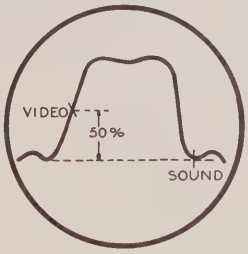


FIG. 5

RADIO ALIGNMENT INSTRUCTIONS

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
To set pointer turn tuning capacitor fully closed and set pointer parallel to base of dial at low frequency end of dial.

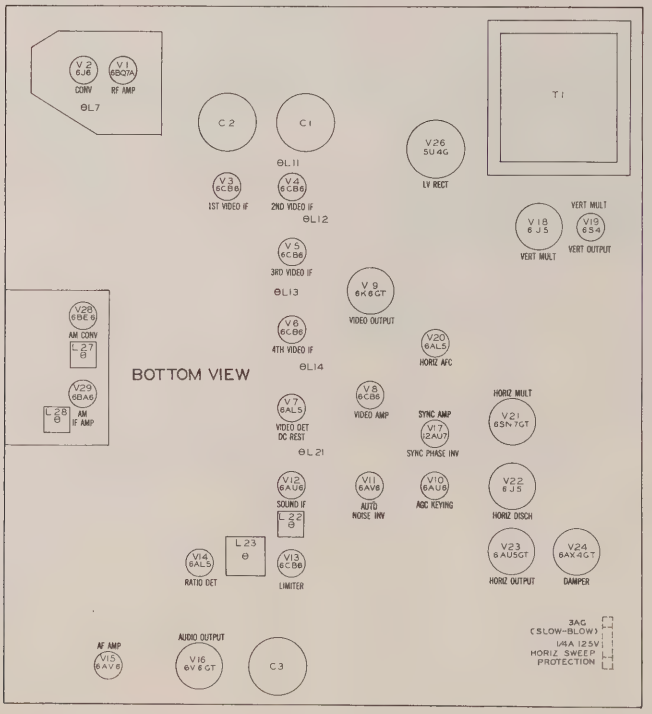
	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
15.	.1MFD	High side to pin 7 (grid) of 6BE6 (V27). Low side to chassis.	455KC (400~Mod)	Radio	Tuning gang fully closed.	Across voice coil	A28, A29, A30, A31	Adjust for maximum output.
16.		Loop	1620KC	"	Tuning gang fully open.	"	A32	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
17.		"	1500KC	"	Tune to 1500KC signal.	"	A33	"
18.		"	600KC	"	Tune to 600KC signal.	"		Move the sleeve on which antenna loop is wound for maximum output. On some models a small segment of the coil is moveable.

Repeat Steps 17 and 18 for optimum tracking.

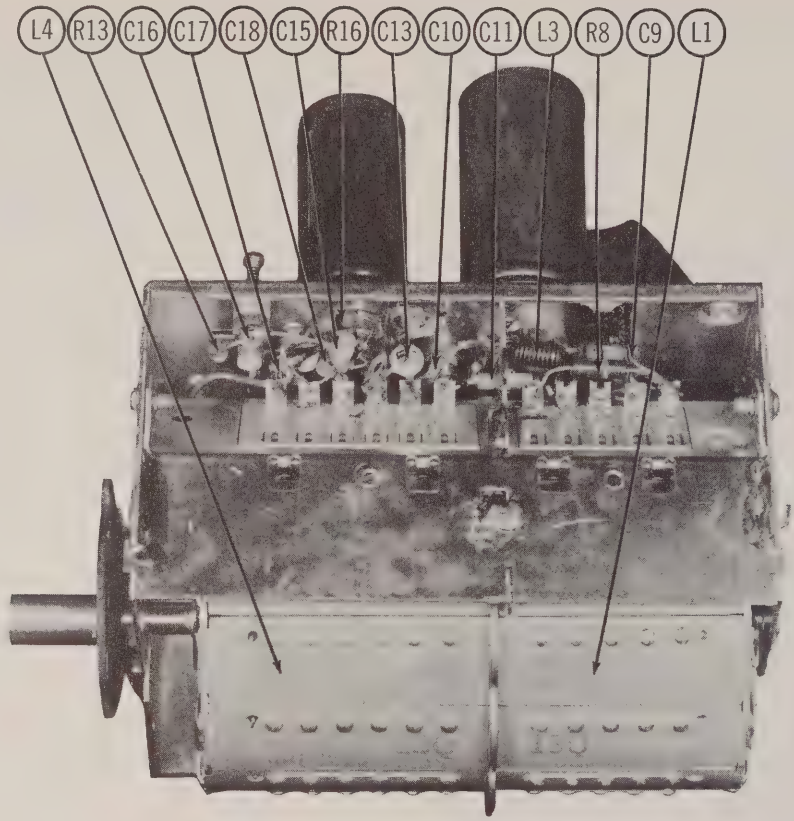
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BQ7A	INF	148KΩ	0Ω	.1Ω	0Ω	†5.2KΩ	†110KΩ	INF	0Ω
V 2	6J6	♦15KΩ	♦15KΩ	.1Ω	0Ω	230KΩ	10KΩ	0Ω		
V 3	6CB6	110KΩ	82Ω	0Ω	.1Ω	♦300Ω	♦300Ω	0Ω		
V 4	6CB6	100KΩ	150Ω	0Ω	.1Ω	♦200Ω	♦200Ω	0Ω		
V 5	6CB6	100KΩ	82Ω	0Ω	.1Ω	♦100Ω	♦100Ω	0Ω		
V 6	6CB6	.3Ω	180Ω	0Ω	.1Ω	♦0Ω	♦0Ω	0Ω		
V 7	6AL5	2 Meg	2.8KΩ	0Ω	.1Ω	95Ω	0Ω	0Ω		
V 8	6CB6	2.8KΩ	195Ω	.1Ω	0Ω	♦2.7KΩ	♦0Ω	0Ω		
V 9	6K6GT	0Ω	0Ω	†4KΩ	♦0Ω	470KΩ	470KΩ	.1Ω	520Ω	
V 10	6AU6	♦72KΩ	♦0Ω	♦.1Ω	♦0Ω	208KΩ	†27KΩ	♦0Ω		
V 11	6AV6	147KΩ	2.8KΩ	0Ω	.1Ω	100KΩ	INF	♦100KΩ		
V 12	6AU6	♦1Ω	♦0Ω	♦0Ω	♦.1Ω	†6.9KΩ	†6.9KΩ	♦120Ω		
V 13	6CB6	♦23KΩ	♦1.1KΩ	♦.1Ω	♦0Ω	†33KΩ	†33KΩ	♦1KΩ		
V 14	6AL5	20KΩ	0Ω	0Ω	.1Ω	INF	0Ω	INF		
V 15	6AV6	4.7Meg	0Ω	0Ω	.1Ω	270KΩ	INF	†470KΩ		
V 16	6V6GT	0Ω	♦.1Ω	†1KΩ	†512Ω	†200KΩ	†100KΩ	♦0Ω	50KΩ	
V 17	12AU7	♦1.5Meg	4.7Meg	0Ω	0Ω	0Ω	♦6.6KΩ	♦1.5Meg	2.2KΩ	.1Ω
V 18	6J5	0Ω	0Ω	▲3Meg	■2Meg	470KΩ	▲156KΩ	.1Ω	75KΩ	
V 19	6S4	INF	1.6KΩ	2.2Meg	0Ω	.1Ω	2.2Meg	INF	INF	▲7.3KΩ
V 20	6AL5	10Ω	10Ω	0Ω	.1Ω	4.8Meg	0Ω	4.8Meg		
V 21	6SN7GT	12KΩ	†100KΩ	1.5KΩ	5.1Meg	†5.7KΩ	1.5KΩ	.1Ω	0Ω	
V 22	6J5	0Ω	.1Ω	†180KΩ	INF	220KΩ	10Ω	0Ω	0Ω	
V 23	6AU5GT	470KΩ	0Ω	600Ω	INF	▲24.4Ω	INF	.1Ω	†10 KΩ	
V 24	6AX4GT	INF	INF	4 Meg	INF	†42Ω	†42Ω	0Ω	.1Ω	
V 25	1B3GT	PINS 1 - 8 HAVE INF RESISTANCE								Top Cap ▲405Ω
V 26	5U4G	INF	50KΩ	INF	26.7Ω	INF	24.8Ω	INF	50KΩ	
V 27	6BE6	22KΩ	.3Ω	‡.1Ω	‡0Ω	‡♦6.8KΩ	‡♦6.8KΩ	3.5Meg		
V 28	6BA6	2.5Meg	0Ω	‡.1Ω	0Ω	‡♦6.8KΩ	‡♦6.8KΩ	‡68Ω		
V 29	21FP4A	.1Ω	1 Meg	Pin 6 150Ω	Pin 10 ▲1 Meg	Pin 11 ▲140KΩ	Pin 12 0Ω			

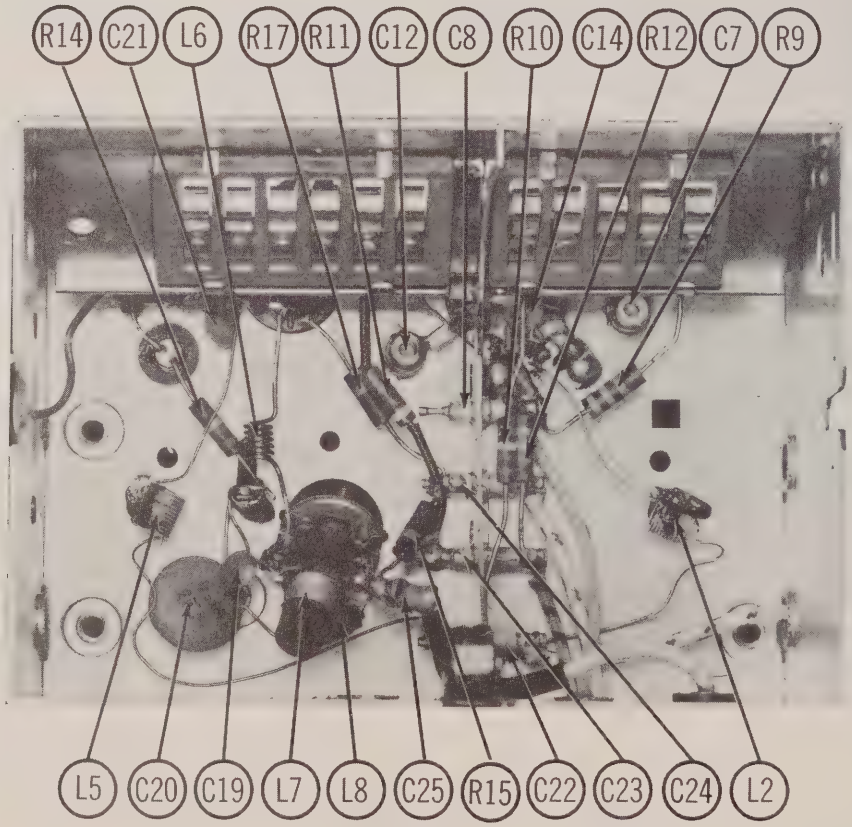
ALL MEASUREMENTS TAKEN IN "TV" POSITION UNLESS NOTED.
♦ MEASURED FROM 115VDC LINE
† MEASURED FROM PIN 2 OF V26.
▲ MEASURED FROM PIN 3 OF V24.
‡ MEASURED IN RADIO POSITION.



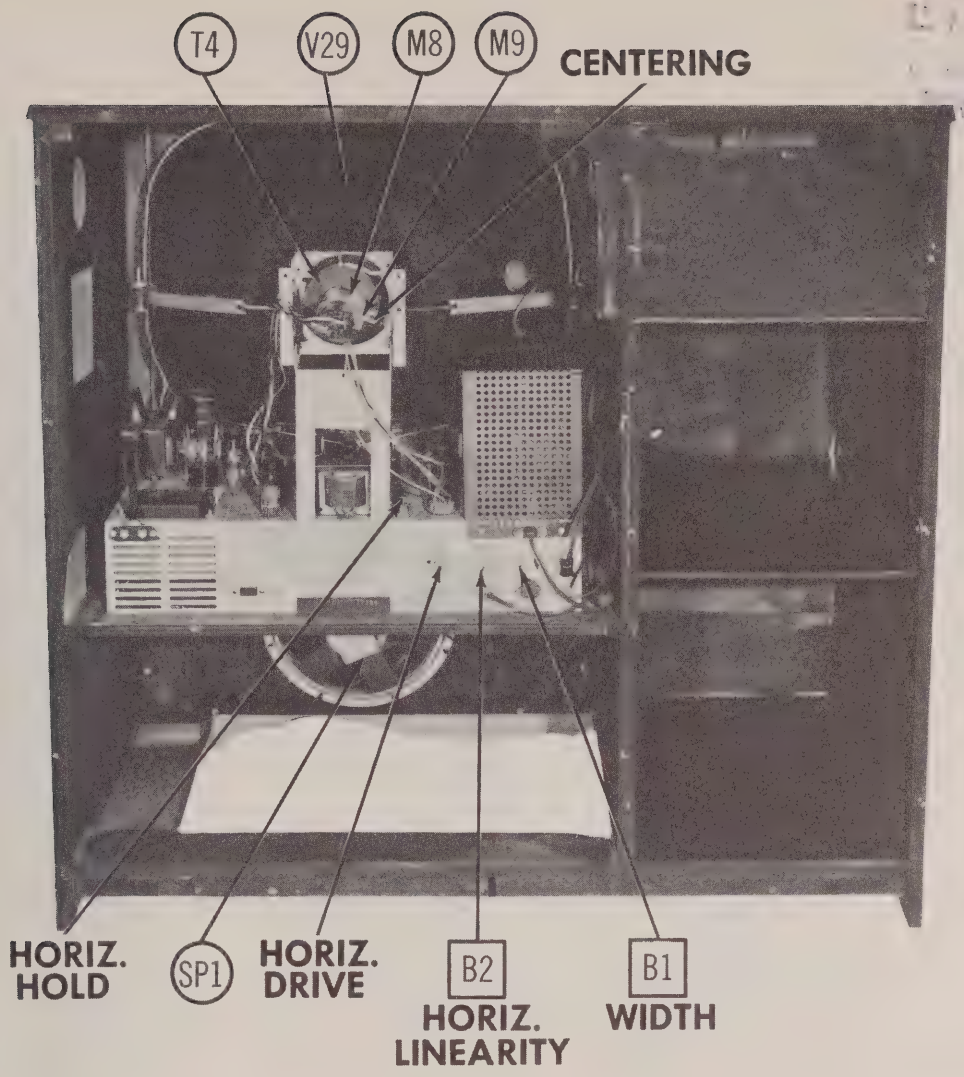
TUBE PLACEMENT CHART



RF TUNER-RIGHT SIDE



RF TUNER-BOTTOM VIEW



CABINET-REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

Turn the horizontal hold adjustment to synchronize the picture horizontally.

Adjust the horizontal drive control clockwise as far as possible without the presence of vertical white lines or compression of the center of the picture.

Adjust the width slug (B1) for a picture slightly wider than necessary to fill the picture mask horizontally.

Adjust the horizontal linearity slug (B2) for a picture that is symmetrical from left to right.

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

See "Loss of High Voltage".

INSUFFICIENT SWEEP

Substitute V22, V23 and V24. Check waveform at W16.

If Satisfactory	If Unsatisfactory
Check C85, C86, C87, R104, R105, R106, T2 and other components associated with V23 and V24.	Check C80, C81, C82, C83, C84, R99, R101 and other components associated With V21 and V22.

DRIVE LINES

Substitute V22, V23 and V24. Check adjustment of horizontal drive control. Check C82, R102, C86, C87, T2 and other associated components.

COMPRESSED LEFT SIDE

Substitute V23, V24 and V22. Check T2, C85, C83, C84, R105 and other components associated with the horizontal output stage.

FOLDS

Substitute V21, V22, V23 and V24. Check C85, C86, C87 and C89. Check T2 and other associated components.

XMAS TREE EFFECT

Substitute V21. Check C78 for open. Check L24 for shorted turns.

VERTICAL

LOSS OF SWEEP

Substitute V18 and V19. Check waveform at W10.

If Satisfactory	If Unsatisfactory
Check T3, R106, yoke and other associated components.	Check C68, C70, C71 and other components associated with V18.

INSUFFICIENT SWEEP

Substitute V18 and V19. Check C2C and C5. Proceed as outlined under "Loss of Sweep".

COMPRESSED AT BOTTOM

Substitute V18 and V19. Check T3, yoke, C2C, C5 and other associated components.

COMPRESSED AT TOP

Substitute V18 and V19. Check C70, T3, yoke and other components associated with V18 and V19.

FOLDS

Substitute V18 and V19. Check C5, yoke and T3. Check other components associated with V18 and V19.

SYNC

HORIZONTAL

LOSS OF SYNC

Substitute V20 and V21. Check C76, C77, C78, C79 and C80. Check other associated components.

CRITICAL SYNC

Substitute V17, V20 and V21. Check circuit components associated with these stages.

PULLING PICTURE

Substitute V20, V21 and V22. Check C76, C77, and other components associated with the horizontal control circuit.

VERTICAL

LOSS OF SYNC

Substitute V17 and V18. Check C65, C66, vertical integrator network and other associated components.

CRITICAL SYNC

Substitute V17 and V18. Check signal at W6 for signal overload and sync compression.

If Satisfactory	If Unsatisfactory
Proceed as outlined under "Loss of Sync".	Trace signal to point of overload and check components of that stage.

TRIGGERING

Substitute V17, V18 and V19. Check circuit near these stages for filament lead dress.

VIDEO

LOSS OF VIDEO

Substitute V7, V8 and V9. Check C41, C42, C43 and other components associated with these stages. Check picture tube.

SOUND BARS

Check local oscillator in RF tuner for misadjustment. C heck adjustment of 4.5MC Trap (A15) and sound take-off coil (A10).

POOR RESOLUTION

Check V1, V2, V3, V4, V5, V6, V7, V8 and V9 by substitution. Check alignment of Video IF and RF tuner.
Check components associated with these stages.

POOR CONTRAST

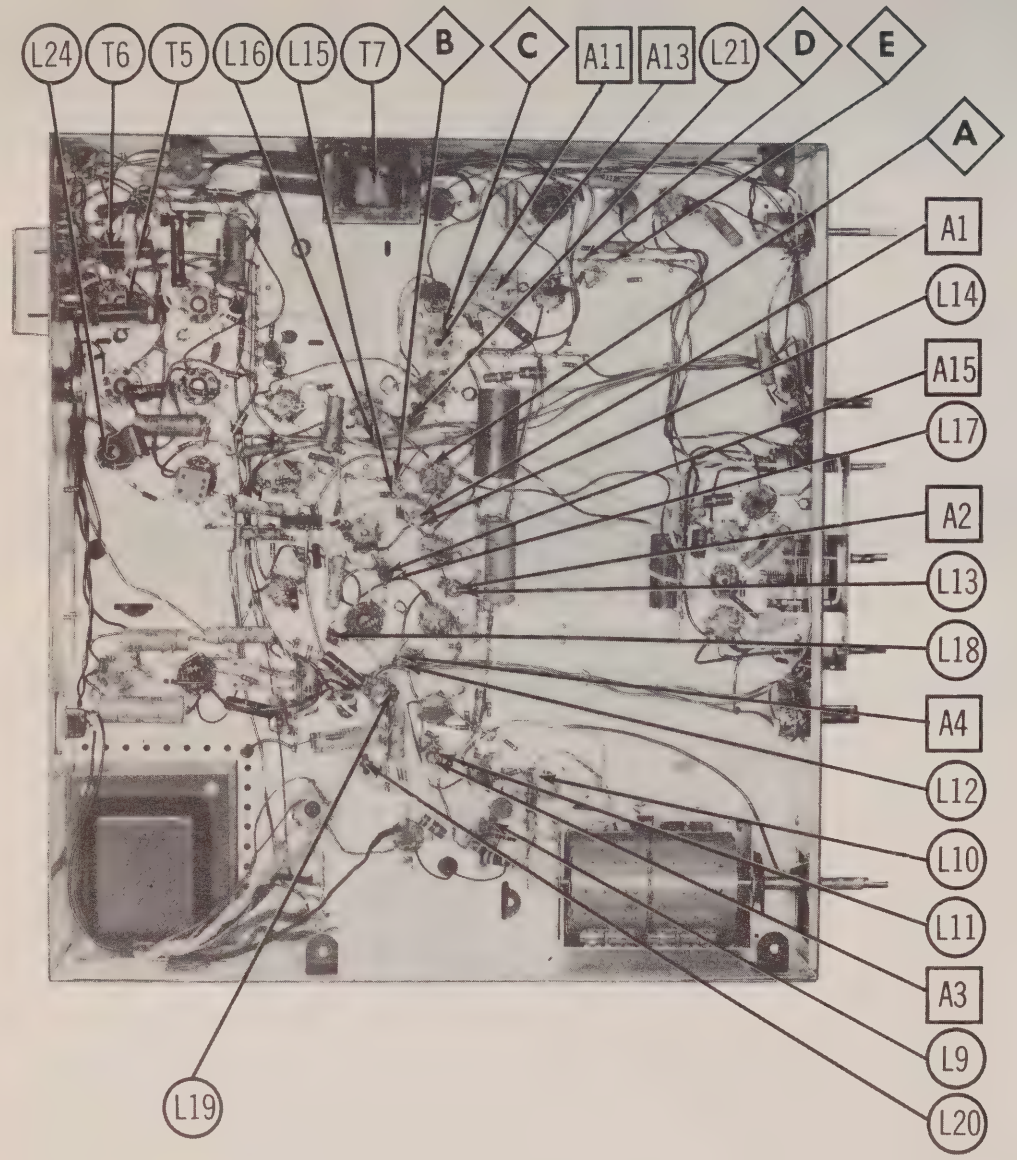
Substitute V7, V8 and V9. Check C40, C41, C42 and C43 for leaky condition.
Check other components associated with these stages.
Check picture tube.

SMEAR

Substitute V7, V8 and V9. Check C40, C41, C42 and C43. Check L15 and L18 for open. Check R36 and R40 for change of value.
Check picture tube and other associated components.

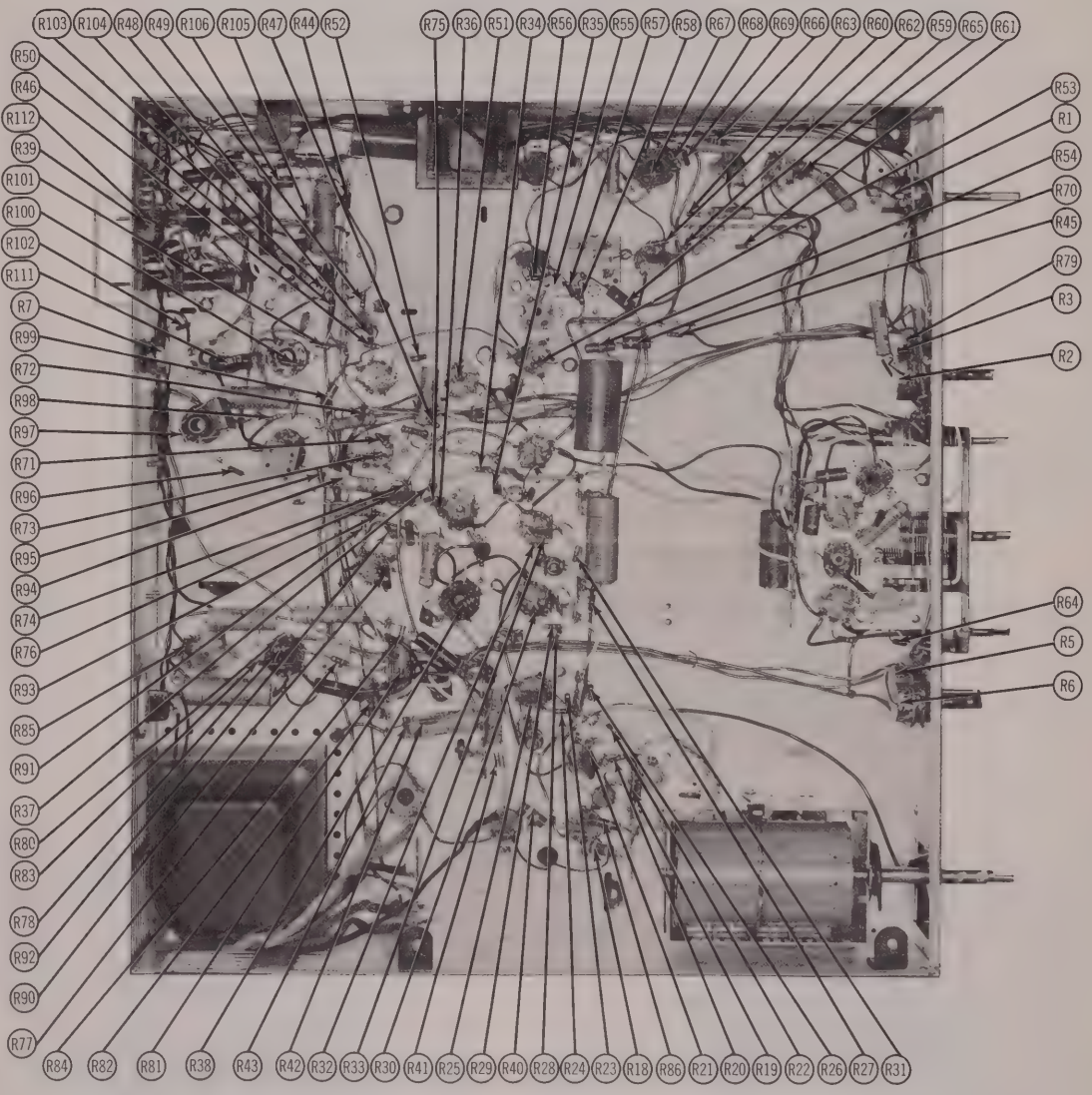
ONE BLACK BAR ACROSS PICTURE

Check Tuner, Video IF, Video detector and Video amplifier tubes for heater to cathode leakage.



TV CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

PROPERTY OF
L. F. ELECTRONICS
DENVER, COLORADO



TV CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

L. F. DUNNEWOLD
3324 MEADE ST.
DENVER, COLORADO

ITEM No.	USE	REPLACEMENT DATA: Packard-Bell PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RTMA BASE TYPE	NOTES
V1	RF Amplifier	6BQ7A	6BQ7A	9AJ	
V2	Converter	6J6	6J6	7BF	
V3	1st. Video IF Amp.	6CB6	6CB6	7CM	
V4	2nd. Video IF Amp.	6CB6	6CB6	7CM	
V5	3rd. Video IF Amp.	6CB6	6CB6	7CM	
V6	4th. Video IF Amp.	6CB6	6CB6	7CM	
V7	Video Detector - DC Restorer	6AL5	6AL5	6BT	
V8	Video Amplifier	6CB6	6CB6	7CM	
V9	Video Output	6K6GT	6K6GT	7S	
V10	AGC Keying	6AU6	6AU6	7BK	
V11	Aut. Noise Inv.	6AV6	6AV6	7BT	
V12	Sound IF Amp.	6AU6	6AU6	7BK	
V13	Limiter	6CB6	6CB6	7CM	
V14	Ratio Detector	6AL5	6AL5	6BT	
V15	AF Amplifier	6AV6	6AV6	7BT	
V16	Audio Output	6V6GT	6V6GT	7S	
V17	Sync Amplifier - Sync Phase Inv.	12AU7	12AU7	9A	
V18	Vert. Mult.	6J5	6J5	6Q	
V19	Vert. Mult. - Vert. Output	6S4	6S4	9AC	
V20	Horiz. AFC	6AL5	6AL5	6BT	
V21	Horiz. Mult.	6SN7GT	6SN7GT	8BD	
V22	Horiz. Discharge	6J5	6J5	6Q	
V23A	Horiz. Output	6AU5GT	6AU5GT	6CK	
B	Horiz. Output	6AV5GT	6AV5GT	6CK	
V24	Damper	6AX4GT	6AX4GT	4CG	
V25	HV Rectifier	1B3GT	1B3GT	3C	
V26	LV Rectifier	5U4G	5U4G	5T	
V27	AM Converter	6BE6	6BE6	7CH	
V28	AM IF Amplifier	6BA6	6BA6	7BK	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: Packard-Bell PART No.	REPLACEMENT DATA: SYLVANIA PART No.	RTMA BASE TYPE	NOTES
V29A	21FP4A	21FP4A 21FP4 ①	12C	① Circuit changes necessary
B	24BP4			

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: Packard-Bell PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C1A	■40	450	24055	AFH3-159		C118		FP375	TVL-3764	
B	▲40	450								
C	▲100	200								
C2A	■40	450	24055	AFH3-159		C118		FP375	TVL-3764	
B	▲40	450								
C	▲100	200								
C3A	▲25	25	24069					FP424.1		
B	■5	75								
C	100	15								
D	▲5	75								
C4	40	350	24063	PRS450/40		BR4035		TC78	TVA-1611	
C5	10	600	24068	PRS600/10		BRHV610		TC92	TVA-1955	
C6	50	50	24042	PRS50/50		BR505		TC39	TVA-1308	
C7	3-9				829-10					
C8	1000			CN-1-001	MFT-1000				503C-D1	
C9	3			SI3NP0			NP0K-030	ZT-553		
C10	1.5			SI1.5NP0	TCZ-1.5		NP0K-1R5	ZT-5515	5TCCB-V15	
C11	1000			CN-1-001	MFT-1000				503C-D1	
C12	.5-3				829-3			CT565A		
C13	51			SI51	D6-500	TM5Q5	GP1K-510	UC-545	5GA-Q5	
C14	1000			BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C15	47			BPD-000047	D6-470	TM5Q5	GP1K-470	UC-5447	5GA-Q47	
C16	.5-3				829-3			CT565A		
C17	5			SI5N750	TCN-5		N750K-050	NT-555	5TCUB-V5	
C18	10			SI10NP0	TCZ-10		NP0K-100	ZT-541	5TCC-Q1	
C19	6.8			SI6.8NP0	TCZ-6.8		NP0K-6R8 N750L-730	ZT-5568	5TCCB-V68	
C20	73									
C21	1000			BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C22	1000			CN-1-001	MFT-1000				503C-D1	
C23	1000			CN-1-001	MFT-1000				503C-D1	
C24	1000			CN-1-001	MFT-1000				503C-D1	
C25	300			SI300	D6-301		GP2K-301	UC-533	5GA-T3	
C26	5000		23931	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C27A	1500		23954	BPD-2X0015	DD-2-152	TM5DD15	812-0015	DCD-5215	5HK-2D15	
B	1500									
C28A	10000		23962	BPD-2X01	DD-3-103	TM5DS1	811-01	DC-511	5HK-2S1	
B	10000						811-01	DC-511		
C29	85	500								
C30A	1500		23954	BPD-2X0015	DD-2-152	TM5DD15	812-0015	DCD-5215	5HK-2D15	
B	1500									
C31	10000		23939	BPD-01	DD-1032	TM5S1	811-01	DC-511	5HK-S1	
C32	150	500		1469-00015		5R5T15		MCE236		
C33A	1500		23954	BPD-2X0015	DD-2-152	TM5DD15	812-0015	DCD-5215	5HK-2D15	
B	1500									
C34	85	500								Note 1
C35A	1500		23954	BPD-2X0015	DD-2-152	TM5DD15	812-0015	DCD-5215	5HK-2D15	
B	1500									
C36	150	500		1469-00015		5R5T15		MCE236		Note 1
C37	5000		23931	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C38	5		23908	SI5N750	TCN-5		N750K-050	NT-555	5TCUB-V5	
C39	10		23927	SI10NP0	TCZ-10		NP0K-100	ZT-541	5TCC-Q1	
C40	5000		23931	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (CONT.)

ITEM No.	RATING CAP.	RATING VOLT	Packard-Bell PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C41	.05	200	23017	P288-05	DF-503	PT2E5		PT415	27M-S5	
C42	.1	600	23012	P688-1	DF-104	PT6E1P1		PT601	67M-P1	
C43	.02	600	23007	P688-02	DD-203	PT6E32		PT612	67M-S2	
C44	.1	200	23019	P288-1	DF-104	PJ2P1		PT401	27M-P1	
C45	470	1000	23967	HVD15-000-47					10GA-T47	
C46	5000		23931	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C47	1.0	100	23040	484-1		PJ2W1		PT41	27M-M1	
C48	.1	200	23019	P288-1	DF-104	PJ2P1		PT401	27M-P1	
C49	2.2		23969	SI2.2NP9	TCZ-2.2		NP9K-2R2		57CCB-V22	
C50	75			SF75N750	TCN-75		N750L-750	NT-5475	67CU-Q75	
C51A	4000	}	23955	BPD-2X004	DD-2-502	TM5DD4	822-004	DCD-524	5HK-2D4	
B	4000									
C52	100		+23970	SI100	D6-101	TM5T1	GP1K-101	UC-531	5GA-T1	
C53A	4000	}	23955	BPD-2X004	DD-2-502	TM5DD4	822-004	DCD-524	5HK-2D4	
B	4000									
C54	10000		23939	BPD-01	DD-1032	TM5B1	811-01	DC-511	5HK-S1	
C55	470		23916	SI470	D6-471	TM5T5	GP2K-471	UC-5347	5GA-T47	
C56	.003	600	23016	P688-003	D6-302	PTE6D3	GP2-333-302	PT623	67M-D3	
C57	.02	600	23007	P688-02	DD-203	PTE6S2		PT612	67M-S2	
C58	10000		23939	BPD-01	DD-1032	TM5B1	811-01	DC-511	5HK-S1	
C59	10000		23939	BPD-01	DD-1032	TM5B1	811-01	DC-511	5HK-S1	
C60	.02	600	23007	P688-02	DD-203	PTE6S2		PT612	67M-S2	
C61	.02	600	23007	P688-02	DD-203	PTE6S2		PT612	67M-S2	
C62	.005	600	23004	P688-005	D6-502	PTE6D5	GP2-333-502	PT625	67M-D5	
C63	1500		23938	SI 1500	D6-152	TM5D15	GP2L-152	UC-5215	5HK-D15	
C64A	.002	}		{P688-002}		{TM5D2}		{PT622}		
B	.005	}	†23951	{P688-005}	†PC-100	{PTE6D5}	†1405-01	{PT625}	†101C1	
C	.005			P688-005		PTE6D5		PT625		
C65	.002	600	23002	P688-002	D6-202	PTE6D2	GP2-333-202	PT622	67M-D2	
C66	1200	500	23219							
C67	.5	200	23035	P288-5		PJ2P5		PT405	27M-P5	
C68	.05	600	23017	P688-05	DF-503	PTE6S5		PT615	67M-S5	
C69	.01	600	23006	P688-01	D6-103	PTE6S1	GP2-333-103	PT611	67M-S1	
C70	.1	600	23012	P688-1	DF-104	PTE6P1		PT601	67M-P1	
C71	200	2500	23958						30GA-T2	
C72	.01	600	23006	P688-01	D6-103	PTE6S1	GP2-333-103	PT611	67M-S1	
C73	.001	600	23001	P688-001	D6-102	PTE6D1	GP2L-102	PT621	67M-D1	
C74	1500		23936	SI1500	D6-152	TM5D15	GP2L-152	UC-5215	5HK-D15	
C75	1500		23936	SI1500	D6-152	TM5D15	GP2L-152	UC-5215	5HK-D15	
C76	.005		123960	P688-005	D6-502	PTE6D5	GP2-333-502	PT625	67M-D5	
C77	.05	200	23010	P288-05	DF-503	PJ2S5		PT415	27M-S5	
C78	4000	500	23208	1464-004		IDR5D4		MCB463	MG-24	
C79	1200	500	23219							
C80	.002	600	23002	P688-002	D6-202	PTE6D2	GP2-333-202	PT622	67M-D2	
C81	5000		23931	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C82	1000		23943	SI270	D6-271		GP1K-271	UC-5327	5GA-T27	
C83	10000		23939	BPD-01	DD-1032	TM5B1	811-01	DC-511	5HK-S1	
C84	5000		23931	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C85	.1	600	23012	P688-1	DF-104	PTE6P1		PT601	67M-P1	
C86	.05	600	23010	P688-05		PTE6S5		PT615	67M-S5	
C87	.068	400	23041	P486-068		PTE4S68			47M-S68	
C88	.05	20000	23959	HV20C	TV3-502	MM-C20T5	413-501		20DK-T5	
C89	.1	600	23012	P688-1	DF-104	PTE6P1		PT601	67M-P1	Note 2
C90	47	2000	23958	HVD30-0000-47				MCL447	20GA-Q47	
C91	.01	125VAC	23932							
C92	.01	125VAC	23932							
C93	220		23915	SI220	D6-221		GP3K-221	UC-5322	5GA-T22	
C94	.05	200	23017	P288-05	DF-503	PJ2S5		PT415	27M-S5	
C95	220		23915	SI220	D6-221		GP3K-221	UC-5322	5GA-T22	
C96	10000		23939	BPD-01	DD-1032	TM5B1	811-01	DC-511	5HK-S1	
C97	10000		23939	BPD-01	DD-1032	TM5B1	811-01	DC-511	5HK-S1	
C98A	100	}	*23930	SI100	*PC-50	TM5T5	*1403-01	UC-531	*100C1	
B	100			SI100		TM5T1		UC-531		

Note 1. Not used in early production.
Note 2. Model 2922 uses .05MFD in this application (Part No. 23010)
+ Items C32, R55 are combined in one unit.
† Items C64A, C64B, C64C, R 76A, R76B, R76C are combined in one unit.
‡ Items C76, R94 are combined in one unit.
* Items C98A, C98B, R118 are combined in one unit.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS		Packard-Bell PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	5000Ω	2		25850A	QJ-462*		SBBT-765-S	UF53R UR55T154	Contrast-Panel Volume Tap(2) 100KΩ-Rear
B	500KΩ							UB-36	Attach to R1B
C	Switch							UP55L	Brightness-Panel
R2A	500KΩ			25848	QJ-461**		SBB-738	UR254L	Vert. Hold-Rear
B	150KΩ							R100L	Auto. noise inv. -wire wound
R3A	100Ω	2		25846	W-100	A43-100	V-121	Not Req.	Attach to R3A
B	Shaft			Not Req.	Not Req.	KS8-3	Not Req.	Not Req.	Tone
R4A	500KΩ	2		25849	Q11-133	AG-58-S	AB-59	U-50	Attach to R4A
B	Shaft			Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Vert. Linearity-Wire Wound
R5A	5000Ω	2		25845X	WK-5000	A43-5000	V-136	R5000L	Attach to R5A
B	Shaft			Not Req.	Not Req.	KS8-3	Not Req.	DB-36	Horiz. Drive
R6A	3 Meg			25847	QJ-460†		SBB-737		Attach to R7A
B	3 Meg								Height-Rear
R7A	150KΩ			25839C	Q11-129	AG-52-S	AB-46	U-43	Horiz. Drive
B	Shaft			Not Req.	Not Req.	FKS-1/4	AE-1	Not Req.	Attach to R7A

* CONCENTRIKIT EQUIVALENT-KIT K-2, BASE ELEMENTS & SHAFTS B17-114 P1-112 (Panel) B13-135X & R2-204 (Rear) & SWITCH 76-1.
** CONCENTRIKIT EQUIVALENT-KIT K-2, BASE ELEMENTS & SHAFTS B11-133 & P9-104 (Panel) B11-129 & R11-112 (Rear).
† CONCENTRIKIT EQUIVALENT-KIT K-2, BASE ELEMENTS & SHAFTS B11-140 & P9-104 (Panel) B11-140 & R11-112 (Rear).

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	Packard-Bell PART No.	IRC PART No.	NOTES
R8	15KΩ	½			
R9	47KΩ	½			
R10	220KΩ	½		BTS-220K	
R11	470Ω	½		BTS-470	
R12	180KΩ	½		BTS-180K	
R13	10KΩ	½			
R14	220KΩ	½		BTS-220K	
R15	15KΩ	½			
R16	10KΩ	½		BTS-10K	
R17	33KΩ	½			
R18	4700Ω	2	73433	BTB-4700	
R19	120Ω	½	73014	BTS-120	
R20	10KΩ	1	73037		
R21	82Ω	½	73012	BTS-82	
R22	120Ω	½	73014	BTS-120	
R23	100Ω	½	73013	BTS-100	
R24	10KΩ	½	73037		Note 1
R25	150Ω	½	73015	BTS-150	
R26	120Ω	½	73014	BTS-120	
R27	120Ω	½	73014	BTS-120	
R28	100Ω	½	73013	BTS-100	
R29	1800Ω	½	73031	BTS-2300	
R30	82Ω	½	73012	BTS-82	
R31	100Ω	½	73013	BTS-100	
R32	4700Ω	½	73033	BTS-4700	Note 2
R33	180Ω	½	73016	BTS-180	
R34	2700Ω	½	73030	BTS-2700	
R35	100Ω	½	73013	BTS-100	
R36	2700Ω	½	73030	BTS-2700	
R37	22KΩ	½	73041	BTS-22K	
R38	470KΩ	½	73157	BTS-470K	
R39	470Ω	½	73021	BTS-470	
R40	3900Ω	2	73432	BTB-3900	
R41	10KΩ	½	73037	BTS-10K	
R42	1 Meg	½	73161	BTS-1 Meg	
R43	1 Meg	½	73161	BTS-1 Meg	
R44	1 Meg	½	73161	BTS-1 Meg	
R45	33KΩ	½	73043	BTS-33K	
R46	27KΩ	½	73042	BTS-27K	
R47	47K	½	73045	BTS-47K	
R48	100KΩ	½	73149	BTS-100K	
R49	330Ω	½	73031	BTS-330	
R50	100KΩ	½	73149	BTS-100K	
R51	47KΩ	½	73045	BTS-47K	
R52	100KΩ	½	73149	BTS-100K	
R53	120Ω	½	73014	BTS-120	
R54	6800Ω	1	73235	BTA-6800	
R55	22KΩ	½	#23970	BTS-22K	
R56	120Ω	½	73014	BTS-120	
R57	1000Ω	½	73025	BTS-1000	
R58	22KΩ	½	73041	BTS-22K	
R59	33KΩ	2	73443	BTB-33K	
R60	470Ω	½	73021	BTS-470	
R61	22KΩ	½	73041	BTS-22K	
R62	10KΩ	½	73037	BTS-10K	
R63	10KΩ	½	73037	BTS-10K	
R64	33KΩ	½	73043	BTS-33K	
R65	4.7Meg	½	73183	BTS-4.7Meg	
R66	470KΩ	½	73157	BTS-470K	
R67	150KΩ	½	73051	BTS-150K	
R68	270KΩ	½	73054	BTS-270K	
R69	100KΩ	½	73149	BTS-100K	
R70	470Ω	2	73421	BTB-470	
R71	4.7Meg	½	73169	BTS-4.7Meg	
R72	1.5Meg	½	73163	BTS-1.5Meg	
R73	2200Ω	½	73029	BTS-2200	
R74	3300Ω	½	73031	BTS-3300	
R75	3300Ω	½	73031	BTS-3300	
R76A	22KΩ	½		BTS-22K	
B	8200Ω	½	† 23951	BTS-8200	
C	8200Ω	½		BTS-8200	
R77	68KΩ	½	73047	BTS-68K	
R78	470KΩ	½	73157	BTS-470K	
R79	22KΩ	½	73041	BTS-22K	
R80	1 Meg	½	73161	BTS-1 Meg	
R81	150KΩ	½	73151	BTS-150K	
R82	100KΩ	½	73149	BTS-100K	
R83	150KΩ	½	73151	BTS-150K	
R84	12KΩ	½	73038	BTS-12K	
R85	2.2Meg	½	73165	BTS-2.2Meg	
R86	220Ω	1	73234	BTA-220	
R87	560Ω	½	73022	BTS-560	
R88	5600Ω	½	73023	BTS-560	
R89	1000Ω	½	73025	BTS-1000	
R90	10Ω	1	73201		
R91	100KΩ	½	73049	BTS-100K	
R92	100KΩ	½	73049	BTS-100K	
R93	4.7Meg	½	73169	BTS-4.7Meg	
R94	470KΩ	½	#23960	BTS-470K	
R95	1500Ω	½	73027	BTS-1500	
R96	5600Ω	½	73034	BTS-5600	
R97	100KΩ	½	73149	BTS-100K	
R98	12KΩ	½	73038	BTS-12K	
R99	100KΩ	1	73249	BTA-100K	
R100	220KΩ	½	73153	BTS-220K	
R101	180KΩ	½	73052	BTS-180K	
R102	22KΩ	½	73041	BTS-22K	
R103	470KΩ	2	73157	BTS-470K	
R104	500Ω	10	73218	1 3/4A-500	
R105	10KΩ	2	73437	BTB-10K	
R106	5600Ω	2	73434	BTB-5600	
R107	3.3Ω	1	73291		
R108	1 Meg	1	73398		
R109	1 Meg	1	73398		
R110	22Ω	½	73005		
R111	500Ω	5	73417	1 3/4A-500	
R112	100KΩ	½	73149	BTS-100K	
R113	1 Meg	½	73161	BTS-1 Meg	
R114	22KΩ	½	73041	BTS-22K	
R115	33KΩ	½	73435	BTB-6800	
R116	6800Ω	2	73435	BTB-6800	
R117	2.2Meg	½	73165	BTS-2.2Meg	
R118	47KΩ	½	*23935	BTS-47K	
R119	220KΩ	½	73153	BTS-220K	
R120	68Ω	1	73011	BTS-68	
R121	5000Ω	5	73240	1 3/4A-5000	Note 3

Note 1. Some models may use a 8200Ω resistor in this application.
Note 2. Some models may use a 5600Ω resistor in this application.
Note 3. Some models may use a 6800Ω (2 Watt) resistor in this application.
+ Items R55 & C32 are combined in one unit.
‡ Items R94 & C76 are combined in one unit.
† Items R76A, R76B, R76C, C64A, C64B, C64C are combined one unit.
* Items R118, C98A, C98B,are combined in one unit.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	Packard-Bell PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.
T1	117VAC ⑪1.76A	864VCT ,200ADC	5VAC ④ 3A	6.3VAC ⑤1.25A, SEC. 4	89043B	P-8165 ⑫ ⑬	P-3070	TP-358⑬		
				6.3VAC ⑤9.2A						

① Drill new mounting holes.
② Mount on top side of chassis.
⑬ Do not use low taps on high voltage section.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING DC RESISTANCE PRI.	RATING DC RESISTANCE SEC.	Packard-Bell PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.	NOTES
T2	398Ω tap ⑭ 18Ω	41Ω tap ⑭ 4Ω, 13Ω, 39Ω SEC. 2 9Ω	89438		HVO-9⑫⑫	TPB-13⑫	D-19	225T1⑫	Horiz. Output Trans.
T3	1700Ω tap ⑭ 4.7Ω		89434 89434A ④	A-8141	A-3039	TSO-12	A-104X	226T1	Vert. Output Trans.
T4A	25Ω		29542	DY-11A⑤	MDF-71 ⑥	TY-7 ⑥	Y-19 ⑦		Horiz. Deflection Coils
B	45Ω		29542A ⑤						Vert. Deflection Coils
T5	6.4Ωtap ⑪1.6Ω		29531 29531B ⑥			TL-3		209R1	Horiz. Linearity Coil

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING DC RESISTANCE PRI.	RATING DC RESISTANCE SEC.	Packard-Bell PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.	NOTES
T6	8Ω		[illegible] 29540B ⑫		WC-5 ⑩ MWC-1 ⑩ ⑪	TWL-1	WC-12 ⑫	212R1	Widia Coil

① Do not connect terminal 7 to terminal 8.
② Connect linearity coil and capacitor in plate circuit of 6AX4 .
③ Wire as in original circuit, except, connect old terminal "T" to new terminal #4.
④ Alternate vertical output trans.
⑤ Alternate deflection yoke.
⑥ Use original horizontal deflection coil network if necessary.
⑦ Use original deflection coil network.
⑧ Alternate linearity coil.
⑨ Alternate width coil.
⑩ Enlarge mounting hole.
⑪ Do not use secondary.
⑫ Connect to coded blue and red terminals.
⑬ See instruction sheet packed with unit for terminal connections.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING IMPEDANCE	RATING DC RES. PRI.	RATING DC RES. SEC.	Packard-Bell PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	NOTES
T7	7KΩ	3.3Ω	572Ω	48Ω 89436A	A-3849 ①	A-3030 ①	RO-13 ①	S-7X ①	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V. C. IMP.	Packard-Bell PART No.	VIKING PART No.	QUAM PART No.	NOTES
SP1	10"	PM	3.3Ω	83705A ②	10J11	10A31	① Model 2922 uses two speakers Part #83106.

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	Packard-Bell PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Ant. Coils	0Ω CT	0Ω					
L2	Fil. Choke	0Ω						
L3	Neutr.Coil	0Ω						
L4	RF Mixer Grid & Osc. Coils	0Ω						
L5	Fil. Choke	0Ω						
L6	RF Choke	0Ω						
L7	1st.Video IF	.6Ω						
L8	IF Trap	.6Ω						
L9	Fil. Choke	0Ω		29551	19-3001	TV-189	6175	.8 Microhenry
L10	RF Coupling	1Ω		29523				Wound on 3.3KΩ resistor
L11	2nd.Video IF	.3Ω	.3Ω	29553				Includes Trap
L12	3rd.Video IF	.3Ω	.3Ω	29554				Includes Trap
L13	4th.Video IF	.3Ω	.3Ω	29555				Includes Trap
L14	5th.Video IF	.3Ω	.3Ω	29556				Includes Trap
L15	Series Peaking Coil	6.4Ω		29552	19-3093 *	TV-181 *	6177 *	93 Microhenries, wound on 3.9KΩ resistor
L16	Shunt Peaking Coil	11.5Ω		29509	19-3250	TV-185	6181	250 Microhenries
L17	4.5MC Trap	3.8Ω		29548	20-1005 †	TV-151	1470	
L18	Series Peaking Coil	7Ω		29506	19-3125 ■	TV-182	6178	120 Microhenries, wound on 22KΩ resistor
L19	Series Peaking Coil	3.4Ω		29520	19-3036	TV-180	6176	36 Microhenries
L20	Shunt Peaking Coil	5.8Ω		29507	19-3093	TV-181	6177	93 Microhenries
L21	1st.Sound IF	1Ω		29563	17-3400	TV-151	1689	
L22	2nd.Sound IF	3.8Ω	2.4Ω	29541	16-5445	TV-113 ▲	1456 ▲	
L23	Ratio Det.	3.5Ω	.2Ω CT	29054	17-3493	TV-115 ▲	6205 ▲	Tertiary Winding -1.5Ω
L24	Horiz. Osc.	72Ω		29527	19-1576	TV-183	6210	
L25	Ant. Coil	1.2Ω		29345				
L26	Osc.Coil	3.4Ω		29292A				71-Osc. † Tapped ⑤ .3Ω
L27	Input IF	11Ω	10.5Ω	29063	16-6878	BC-352 ▲	12-C1 ▲	
L28	Output IF	17.5Ω	11Ω	29064	16-6878	BC-353 ▲	12-C2 ▲	

* Parallel with 3.9KΩ resistor
† Disconnect capacitor in parallel
■ Parallel with 22KΩ resistor
▲ Use adaptor plate.
▲ Drill one new mounting hole.
† Drill mounting hole.

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D C. RESISTANCE	RATINGS INDUCTANCE (@ CURRENT 1000 ⁰⁄₀)	Packard-Bell PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.
L29	.200ADC	42Ω	1.75 Hy.	27005	C-2326 ①	C-2991 ①	TR-1733 ①	C-17X ①

① Drill one new mounting hole.

FUSES

ITEM No.	TYPE	RATING	Packard-Bell PART No. FUSE	Packard-Bell PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M 1	3AG (Slo-Blo)	1/4A ⑤ 125A	45005		313.250 (3AG 1/4A-(Slo-Blo)	357001	MDL-1/4	4405

PARTS LIST AND DESCRIPTIONS (Continued)

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA							REMARKS
	Packard-Bell PART No.	ASTATIC PART No.		SHURE PART No.		ELECTRO-VOICE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M2		ACD-J	A-1 A-3	W22AB	A65MG A62A	96	0-1 or S-1 and 0-3 or S-3	

ASTATIC SHURE AND ELECTRO VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENT SEE BELOW.

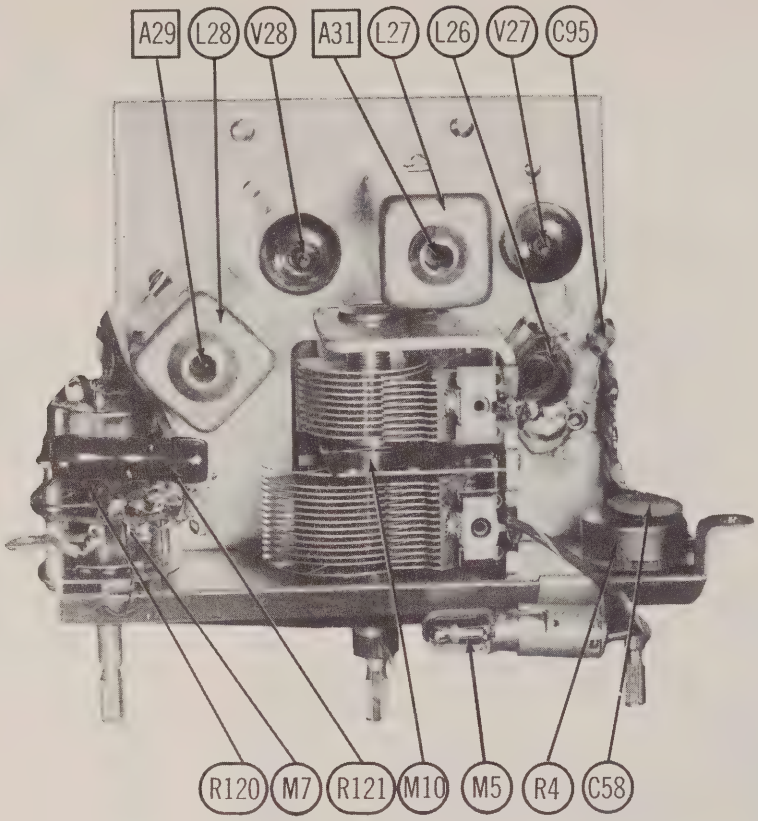
PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

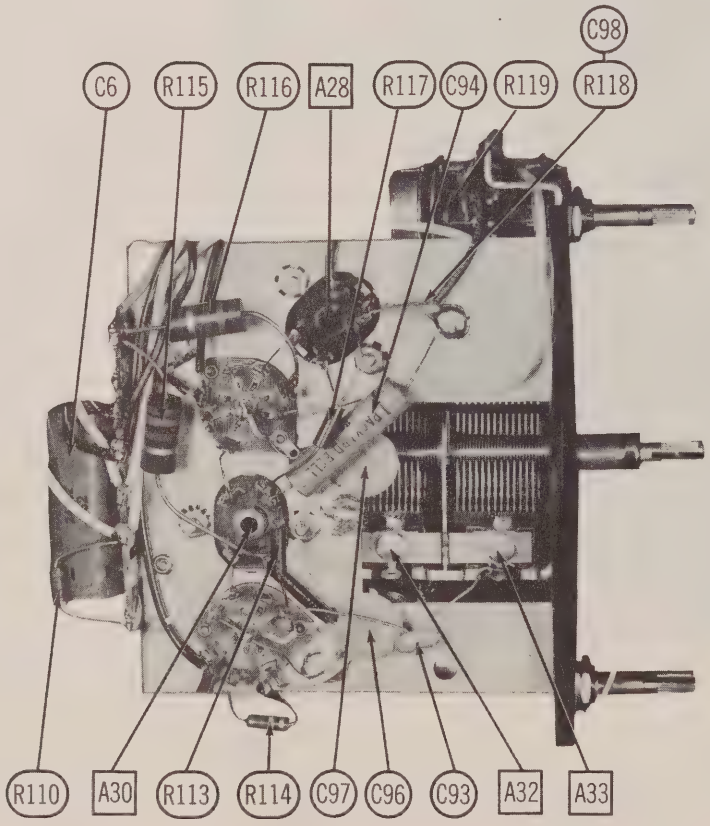
ITEM No.	REPLACEMENT DATA			REMARKS
	Packard-Bell PART No.	WALCO PART No.	JENSEN PART No.	
M3		W-11 A and W-11MGA	W-16 and W-17	

MISCELLANEOUS

ITEM No.	PART NAME	Packard-Bell PART No.	NOTES
M4	Pilot Light	54002	Channel Indicator Type #47
M5	Dial Light	54002	AM Radio, Type #47
M6	RF Tuner	10532	
M7	Switch		Function Selector
M8	Centering Magnet		
M9	Ion Trap	28099	
M10	Tuning Capacitor	23531	35-457MMF, 33-200MMF (Radio)
	Cabinet	2921	Model 2921 (Specify Finish)
	Cabinet	2922	Model 2922 (Specify Finish)
	Escutcheon	41048	Model 2921 (Specify Cabinet finish)
	Escutcheon	41058	Model 2922 (Specify Cabinet finish)
	Knob	52068	Fine Tuning (Specify Cabinet finish)
	Knob	52069-1	Off/On Volume (Specify Cabinet finish)
	Knob	52070	Contrast (Specify Cabinet finish)
	Knob	52067-1	Channel Selector, Model 2921 (Specify Cabinet finish)
	Knob	52076-1	Channel Selector, Model 2922 (Specify Cabinet finish)
	Knob	52080	Function Selector, Tone and "Radio" tuning (3 used) (Specify Cabinet Finish)



RADIO CHASSIS-TOP VIEW



RADIO CHASSIS-BOTTOM VIEW

TROUBLE SHOOTING AIDS (CONT.)

PROPERTY OF
DENVER

AUDIO

WEAK OR NO SOUND

Substitute V12, V13, V14, V15 and V16. Check stages of V15 and V16 by switching to AM Radio.

If Unsatisfactory	If Satisfactory
Check components associated with V15 and V16.	Check ratio detector and sound IF alignment. Check components associated with these stages.

BUZZ

Realign ratio detector. If buzz is still present, substitute V14 and readjust A13 and A14.

DISTORTED

Substitute V12, V13, V14, V15 and V16. Check stages of V15 and V6 by switching to AM Radio position.

If Distorted	If Undistorted
Check components associated with V15 and V16.	Check ratio detector and audio IF circuit and components. Check alignment of ratio detector and audio IF stages.

POWER

SMALL AND/OR DIM RASTER

Substitute V26. Measure B+.

If Low	If Satisfactory
Check filter capacitors and decoupling networks.	Proceed as outlined under "Insufficient High Voltage".

DIM PICTURE WEAK SOUND

Substitute V26 and V16. Proceed as outlined under "Small and/or Dim Raster".

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V21, V22, V23, V24 and V25.
Check waveform at W16.

If Satisfactory	If Unsatisfactory
Check R107, R108, R109, C88, T2, yoke and other associated circuit components.	Check C82, C83, C84 and other components associated with V21, V22 and V23.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V21, V22, V23, V24, V25 and V26. Proceed as outlined under "Loss of High voltage".

BLOOMING

Substitute V22, V23, V24 and V25. Check R107, R108, R109, C88, T2 and yoke. Check picture tube.

GENERAL

RASTER NO SOUND NO PICTURE

Substitute V16, V1, V2, V3, V4, V5, V6 and V7. Check components associated with these stages.

RASTER DIM PICTURE WEAK SOUND

Substitute V16 and check associated circuit components.

RASTER SOUND NO PICTURE

See "Loss of Video".

RASTER SNOWY PICTURE POOR SOUND (Low signal areas)

Check V1, V2, V3, V4, V5, V6 and V7 by substitution.

TOTAL LOSS OF SYNC

Substitute V11 and V17. Check ANI control setting and circuit.

POOR FOCUS

Check adjustment of Focus control.
Check potentials applied to picture tube. Check picture tube.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing. Check for excessive dirt near picture tube anode connection. Check anode lead for insulation break down.

Symptoms shown above are assumed and are not indicative of the quality and workmanship of this receiving equipment.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the RF Tuner Oscillator Circuit may be accomplished by removing the channel selector and fine tuning knobs.

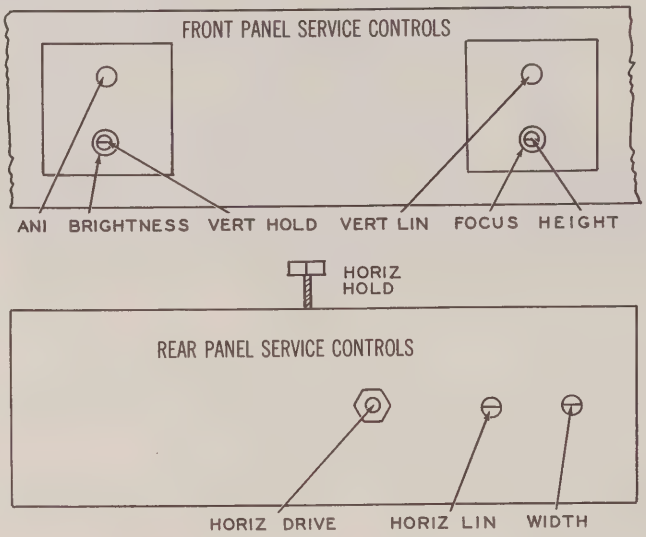
PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass, remove three wood screws holding wood strip at top of cabinet. Remove wood strip and remove safety glass by tilting forward at top. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION



SPECIAL ADJUSTMENTS- AUTOMATIC NOISE INVERTER

Adjustment of the noise inverter control should be made on the weakest signal that will be received. Starting from the extreme counter clockwise position rotate the control clockwise until the picture begins to distort, then turn the control counter clockwise just past the point where the distortion disappears.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator, it is necessary to remove the rear cover and supply power to set. Adjustment is located on top of chassis. Adjust the horizontal hold slug (L24) until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate Sound IF Detector buzz, adjust the ratio detector secondary (L23) located on top of chassis. (See tube placement chart).

FUSES

One fuse is used for horizontal sweep circuit protection. (For location, see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

DISASSEMBLY INSTRUCTIONS

1. Remove 7 push on type control knobs from front panel.
2. Remove 11 wood screws. Remove rear cover.
3. Disconnect speaker, phono motor plug, phono audio plug.
4. Remove 4 chassis bolts. Remove chassis.
5. Remove 4 wood screws. Remove speaker.

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MODEL 53-T2285

PHILCO MODELS AT-2294 (Code 128),
53-T2285, -L, 53-T2286, 53-T2287 (Code 126)

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PHOTOFACT* Folder

*TRADE MARK

RTMA MEMBER RADIO-TELEVISION MANUFACTURERS ASSOCIATION

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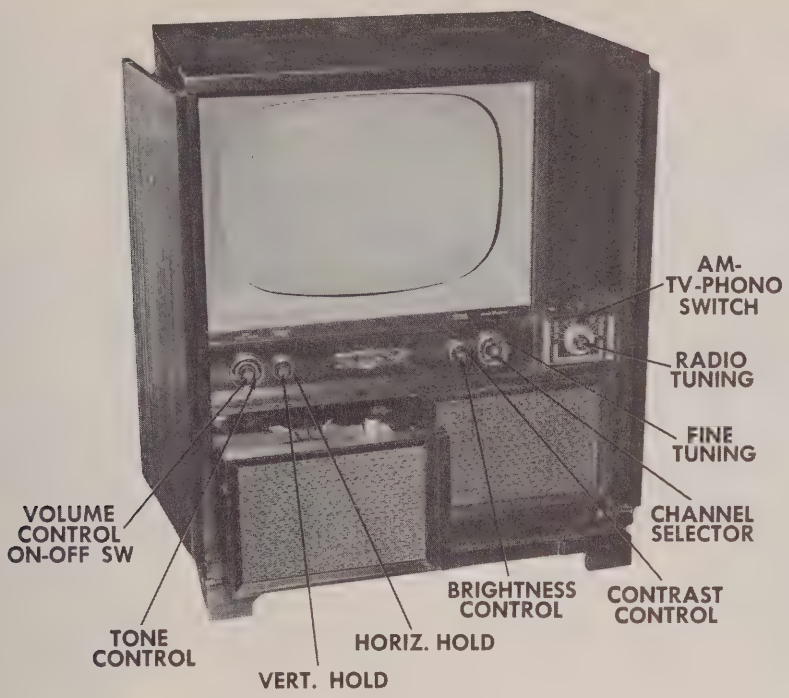

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PHILCO MODEL 53-T2285

TRADE NAME	Philco	MODELS	CODE	RF IF CH.	SWEEP CH.	RADIO CH.	RECORD CHANGER
		AT-2294	128	94	J-4	RT-11	M-24
		53-T2285	126	94	J-4	RT-8	M-24
		53-T2285L	126	94	J-4	RT-8	M-24
		53-T2286	126	94	J-4	RT-8	M-24
		53-T2287	126	94	J-4	RT-11	M-24

MANUFACTURER	Philco Corp., Tioga & "C" Sts., Philadelphia, Pa.
TYPE SET	TV-AM-Phono Combin ation Receiver
TUBES	Twenty-Six
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING 1.7 Amp. @ 117 Volts AC
TUNING RANGE	TV Channels 2 thru 13, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier), Radio 540-1630KC, AM IF 455KC

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PHILCO MODELS
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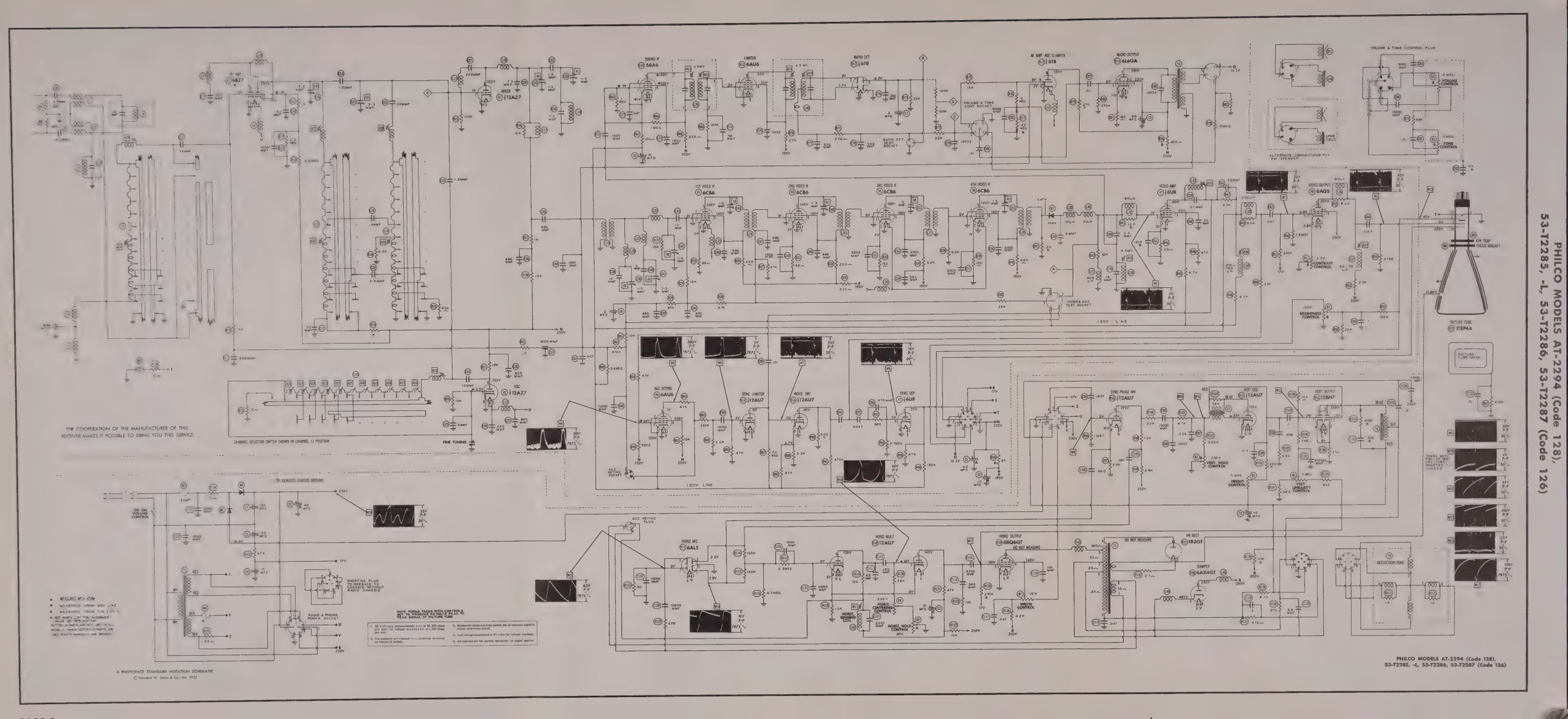
PHILCO MODELS AT-2294 (Code 128),
53-T2285, -L, 53-T2286, 53-T2287 (Code 126)
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 13 POSITION
FINE TUNING
OSC 12AZ7
RF AMP 6BZ7
MIXER 12AZ7
SOUND IF 6BA6
LIMITER 6AU6
RATIO DET 6T8
AV AMP AGC CLAMPER 6T8
AUDIO OUTPUT 6L6GA
VOLUME & TONE CONT SOCKET
RATIO DET TEST SOCKET
ALTERNATE CONNECTIONS FOR EM SPEAKER
VOLUME & TONE CONTROL PLUG
VOLUME CONTROL
TONE CONTROL
1ST VIDEO IF 6CB6
2ND VIDEO IF 6CB6
3RD VIDEO IF 6CB6
4TH VIDEO IF 6CB6
VIDEO AMP 6U8
VIDEO OUTPUT 6AQ5
VIDEO & AGC TEST SOCKET
CONTRAST CONTROL
BRIGHTNESS CONTROL
ION TRAP
FOCUS MAGNET
PICTURE TUBE 21EP4A
AGC KEYING 6AU6
SYNC LIMITER 12AU7
NOISE INV 12AU7
SYNC SEP 6U8
AGC KEYING TEST SOCKET
120V LINE
SYNC PHASE INV 12AU7
VERT OSC 12AU7
VERT OUTPUT 12BH7
HEIGHT CONTROL
VERT LINEARITY CONTROL
VERT HOLD CONTROL
AGC KEYING PLUG
HORIZ AFC 6AL5
HORIZ MULT 12AU7
HORIZ OUTPUT 6BQ6GT
DO NOT MEASURE
HORIZ CENTERING CONTROL
HORIZ HOLD CONTROL
WIDTH CONTROL
HV RECT 1B3GT
DAMPER 6AX4GT
DEFLECTION YOKE
SW ON VOLUME CONTROL
SHORTING PLUG CONNECTS CHASSIS WITHOUT RADIO CHASSIS
RADIO & PHONO POWER SOCKET
DENOTES CHASSIS GROUND
WAVE FORMS TAKEN WITH CONTROLS SET TO PRODUCE RATIO'S PEAK TO PEAK SIGNAL AT PICTURE TUBE
TAKEN WITH PIN 14 OF OSC TUBE SHORTED TO CHASSIS
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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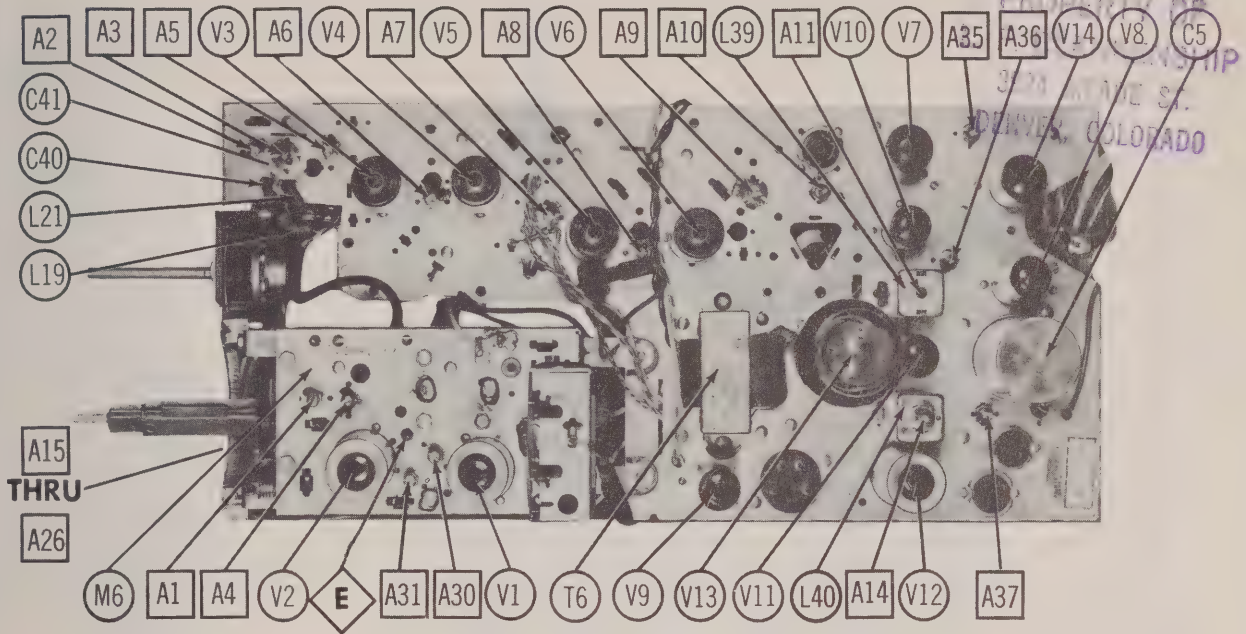
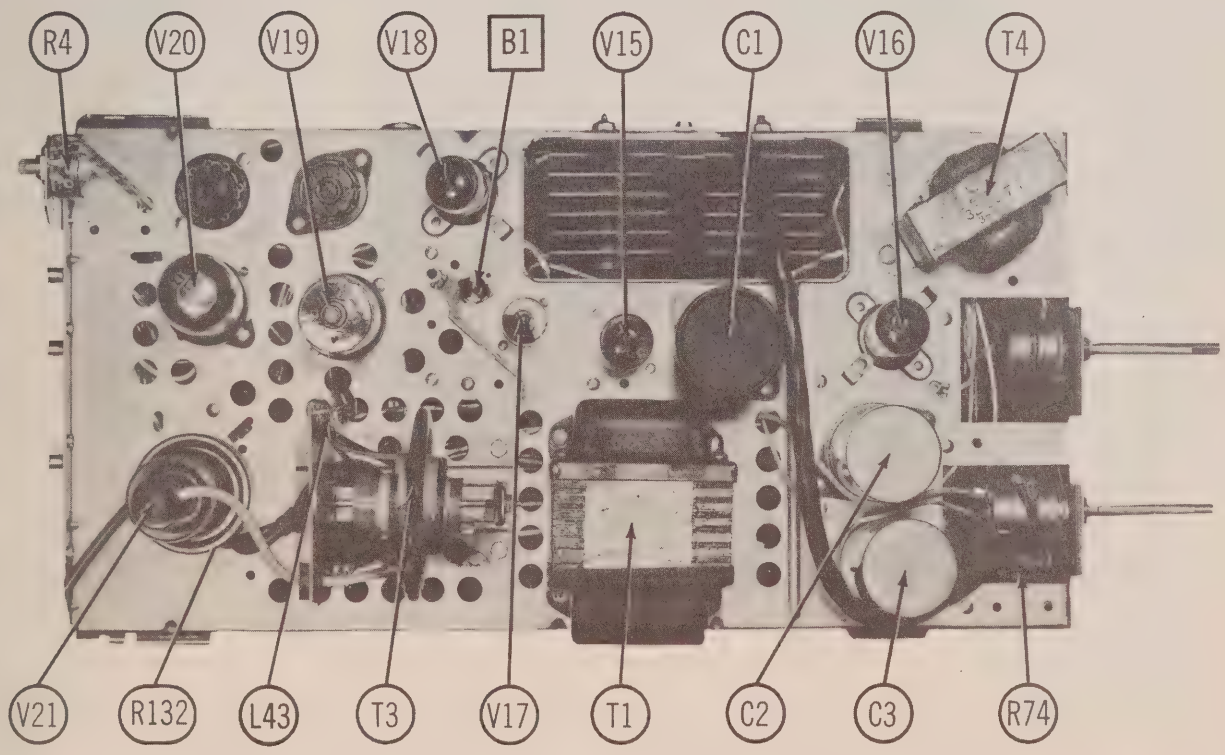
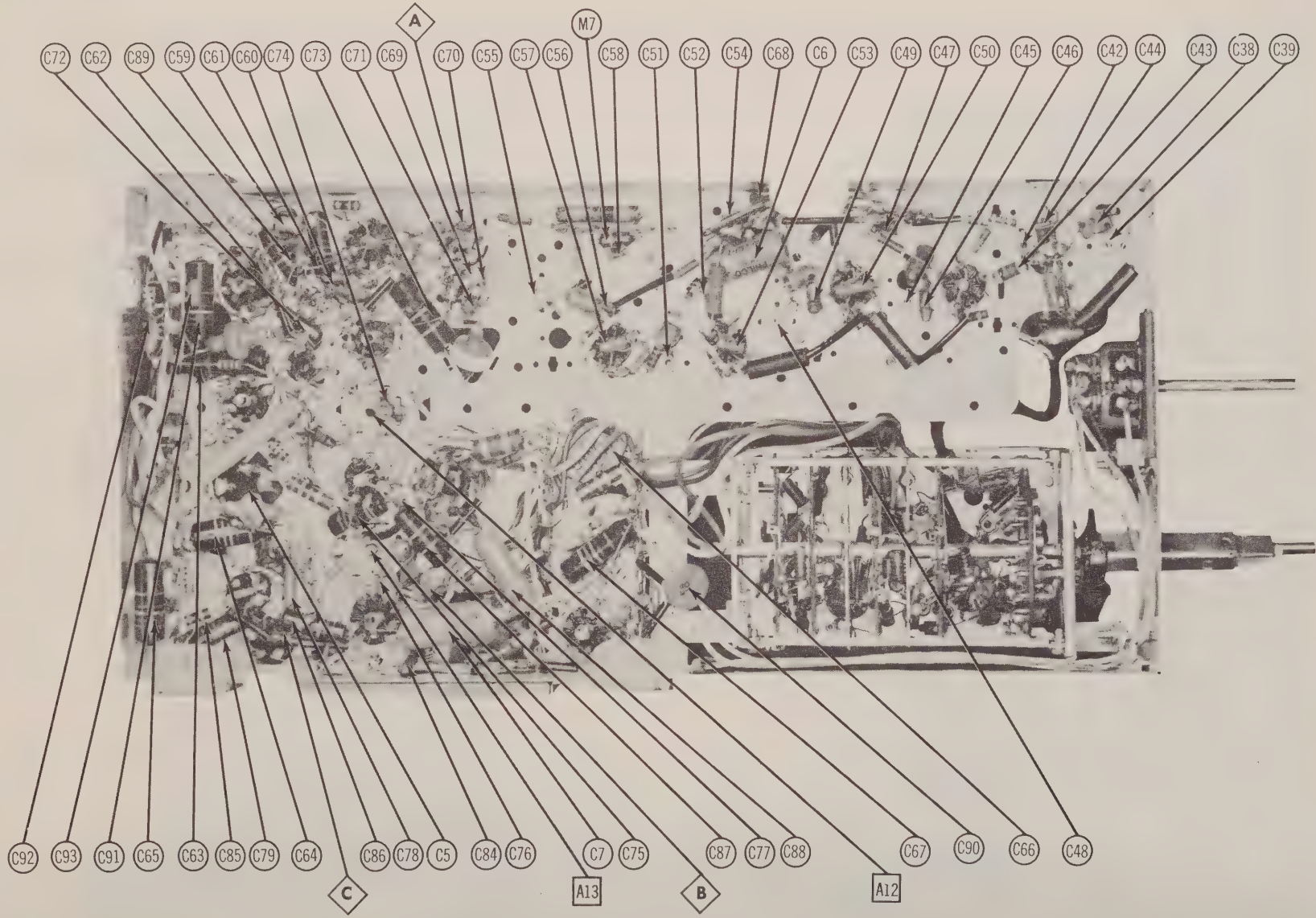
PHILCO MODELS AT-2294 (Code 128), 53-T2285, -L, 53-T2286, 53-T2287 (Code 126)



RF-IF CHASSIS-TOP VIEW

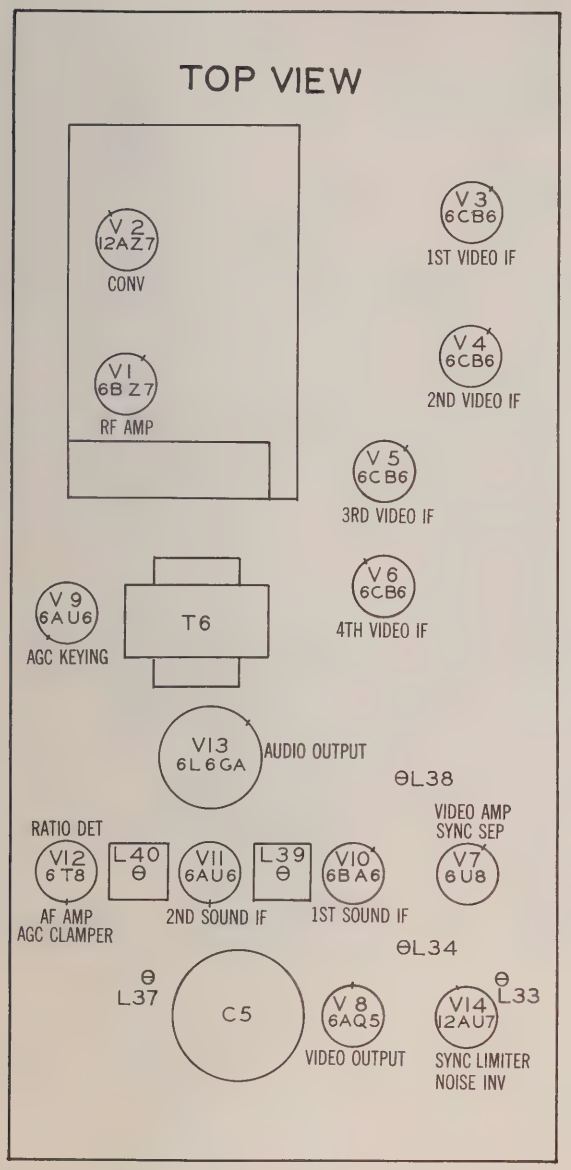


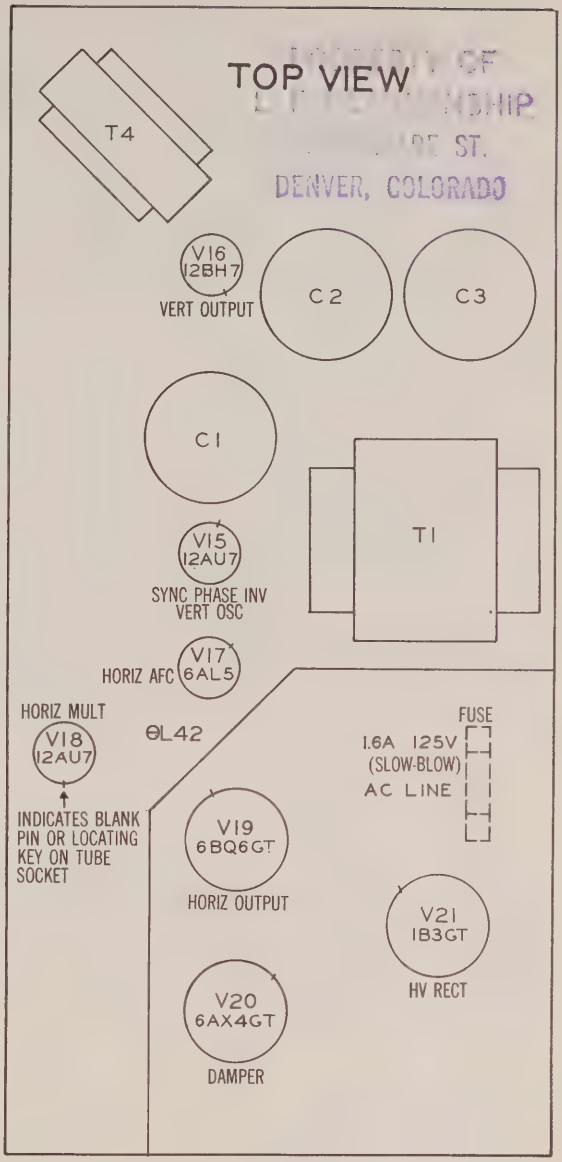
SWEEP CHASSIS-TOP VIEW



RF-IF CHASSIS-BOTTOM VIEW-CAPACITOR AND ALIGNMENT IDENTIFICATION

TUBE PLACEMENT CHART





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TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - Selenium Rectifiers (M1 & M2), Fuse (M3)

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V6
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster - V7, V8, V22
Has pic, no sound - V10, V11, V12, V13
Overloaded picture - V9, V12

SYNC FAILURE
No vert. sync - V15
No horiz. sync - V15, V17, V18
No vert. or horiz. sync - V7, V14, V15

SWEEP FAILURE
No raster, has sound - V18, V19, V20, V21, V22
No vertical deflection - V15,V16
Poor vert. linearity or foldover - V15, V16
Poor horiz. linearity or foldover - V18, V19, V20
Narrow picture - V18, V19, V20, V21, M1 & M2
Vert. off freq. - V15
Horiz. off freq. - V15, V17, V18

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from the chassis. Do not remove the horizontal oscillator tube to disable the high voltage. Use an isolation transformer to protect the test equipment.

VIDEO IF ALIGNMENT

Set the contrast and brightness controls at maximum counter clockwise rotation.
Connect a 10KΩ carbon resistor to pin 1 of the video AGC test jack and another 10KΩ resistor to pin 5 of same jack. Connect the free ends of the 10KΩ resistors together and attach the negative lead of a 7.5 volt bias battery to their junction.
Connect the positive lead of the battery to chassis.
The IF shield must be in place during alignment.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over converter tube (V2). Low side to chassis.	Not used	39.75MC (400∿Mod)	4	Vert. Amp. thru 15KΩ to point (A). (pin 2 of Video AGC test jack). Low side to chassis.	A1	Adjust for MINIMUM 400∿ indication on scope.
2.	"	"	"	47.25MC	"	"	A2	"
3.	"	"	"	41.25MC	"	"	A3	"
4.	"	"	"	42.7MC	"	"	A4	Adjust for maximum 400∿ indication on scope.
5.	"	"	"	45.4MC	"	"	A5	"
6.	"	"	"	42.0MC	"	"	A6	"
7.	"	"	"	45.0MC	"	"	A7	"
8.	"	"	"	44.4MC	"	"	A8	"
9.	"	"	"	43.0MC	"	"	A9	"
10.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	69MC (10MC Swp)	67.25MC	"	"		Loosely couple a separate marker generator to the mixer grid test point on top of tuner Set generator to 45.75MC. Adjust the fine tuning control to zero beat the two markers, as observed on scope. Remove the separate marker generator.
11.	"	"	"	67.25MC 70.75MC	"	"		Check for response curve as in Fig. 1. If necessary retouch A4, A5, A7, A8 and A9 for desired response. A8 affects the tilt of the curve. A9 affects the dip. A4 affects the slope at 70.75MC. A5 and A7 affects the position of the 67.25MC marker.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect -7.5 volt bias supply to pin 5 of the Video AGC test jack to reduce circuit noise indications. Connect the positive lead to chassis. Connect two matched 100KΩ (±1%) resistors in series from point (B) to chassis. The junction of these two resistors is alignment point (D). as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
12.	2200Ω Carbon Resistor	High side to point (A), Low side to chassis.	4.5MC (Unmod)	Any non interfering channel.	DC probe to point (B). Common to chassis.	A10, A11, A12, A13	Adjust for maximum deflection. Attenuate generator output to maintain not more than 10 Volts at VTVM.
13.	"	"	"	"	DC probe to point (C). Common to point (D),	A14	Adjust for zero reading. A positive and negative reading will be obtain on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Connect -7.5 volt bias supply to pin 5 of the video AGC test jack to reduce circuit noise indications. Connect the positive lead to chassis.
Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12.	2200Ω Carbon Resistor	High side to point (A). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any non-interfering channel	Vert. Amp. to point (B). Low side to chassis.	A10, A11 A12, A13	Disconnect stabilizer capacitor C7. Adjust for curve of maximum amplitude and symmetry as in Fig. 2.
13.	"	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A14	Reconnect capacitor C7. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 3. SLIGHTLY retouch A13 for maximum amplitude and straightness of crossover lines.

OSCILLATOR ALIGNMENT

Connect the negative lead of a 1.5 volt bias battery to the white lead on the top of the tuner.
Connect the positive lead to chassis.
Remove the gate pulse plug from its socket.
Couple the 45.75MC output of a second signal generator to the first video IF amplifier tube, V3, by removing the tube shield and attaching the output leads of the generator to the ends of a few turns of wire wrapped around the tube.
The output is set at 45.75MC throughout the entire oscillator alignment.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control at the middle of its range (with the cam stop opposite the channel 8 oscillator tuning core.)

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
14.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	Not used	211.25MC	13	Vert. Amp. thru 15KΩ to point (A). Low side to chassis.	A15	Adjust for zero beat with 45.75MC IF signal as indicated on scope.
				205.25MC	12		A16	
				199.25MC	11		A17	
				193.25MC	10		A18	
				187.25MC	9		A19	
				181.25MC	8		A20	
				175.25MC	7		A21	
				83.25MC	6		A22	
				77.25MC	5		A23	
				67.25MC	4		A24	
				61.25MC	3		A25	
				55.25MC	2		A26	

TV ALIGNMENT INSTRUCTIONS (CONT.)

RF AND MIXER ALIGNMENT

Leave the 1.5 volt bias battery connected as under Oscillator Alignment.
Disconnect the tuner coupling link at the IF terminal strip (near V3) and solder a 68Ω carbon resistor to the open end of the link.
Remove the first IF tube, V3, from its socket.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
15.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	213MC	13	Vert. Amp. thru 100KΩ to point (E). Low side to chassis.	A27, A28 A29	Adjust A27 and A28 for a symmetrical appoximately centered bandpass. Detune A28 counter clockwise until a single peak appears. Adjust A27 until peak falls at 213MC. Adjust A29 for maximum curve height and symmetry of peak. (On late production tuners A29 is omitted). Readjust A27 and A28 for symmetrical response as in Fig. 4.
16.	"	"	177MC (10MC Swp)	177MC	7	"	A30, A31	Check for response as indicated by dotted line curves in Figs. 5A and 5B. If response is not symmetrical and centered about 177MC, adjust A30 and A31 for mirror image of original response curve. This adjustment over compensates to allow for channel 13 adjustment in next step . Repeat adjustments A30 and A31 until centered and symmetrical response curves are obtained on channels 13 and 7.
17.	"	"	85MC (10MC Swp)	85MC	6	"	A32, A33 A34	Adjust A32 and A33 for a symmetrical approximately centered bandpass. Detune A33 counter clockwise until a single peak appears. Adjust A32 until peak falls at 85MC. Adjust A34 for maximum curve height and symmetry. Readjust A32 and A33 for symmetrical response as in Fig. 4.

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4.5MC TRAP ALIGNMENT

Turn the set on and tune in a TV test pattern.
Adjust A35 for maximum vertical wedge definition.

VIDEO PEAKING COIL ADJUSTMENTS

In case of excessive overshoot or smear on some stations it may be necessary to adjust A36 and A37. Alignment of the tuner and IF portions of the receiver must be correct before these adjustments are made. Counter clockwise adjustment will reduce the amount of overshoot, and clockwise adjustment will reduce the amount of smear. Proper adjustment point is the point of minimum smear and trailing whites.

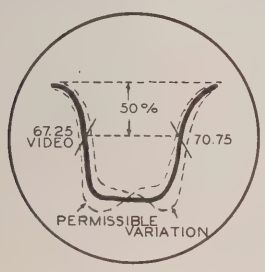


FIG. 1

FIG. 2

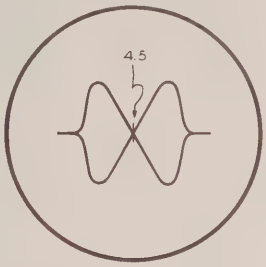


FIG. 3

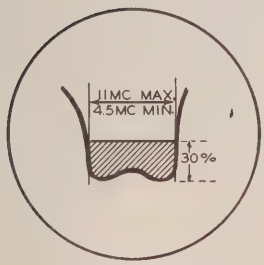


FIG. 4

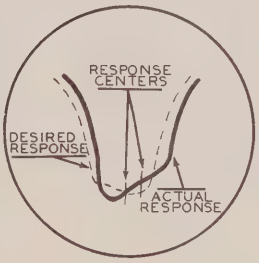


FIG. 5A

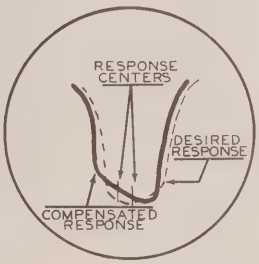


FIG. 5B

RADIO ALIGNMENT INSTRUCTIONS

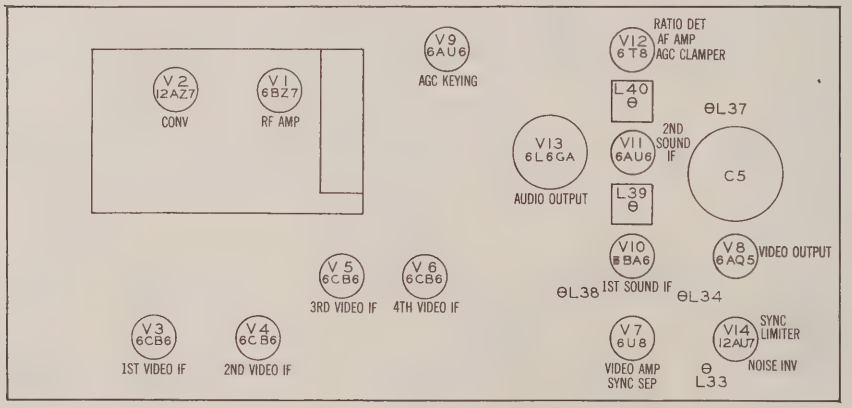
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
18.	.1MFD	High side to pin 6 (grid) of 7A8 (V24). Low side to chassis.	455KC (400%Mod.)	AM	Tuning gang fully closed.	Across voice coil	A38, A39, A40, A41	Adjust for maximum output.
19.	"	"	1630KC	"	1630KC (See Remarks)	"	A42	Fully open tuning capacitor, place a 6 mil shim beneath heel of rotor plates, close rotor to touch shim and remove shim without disturbing capacitor setting. Adjust A42 for maximum output.
20.		Loop	1630KC	"	1630KC	"	A43, A44,	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
21.		"	580KC	"	580KC	"	A45	"
22.	Repeat steps 20 and 21 until no further improvement is noted.							

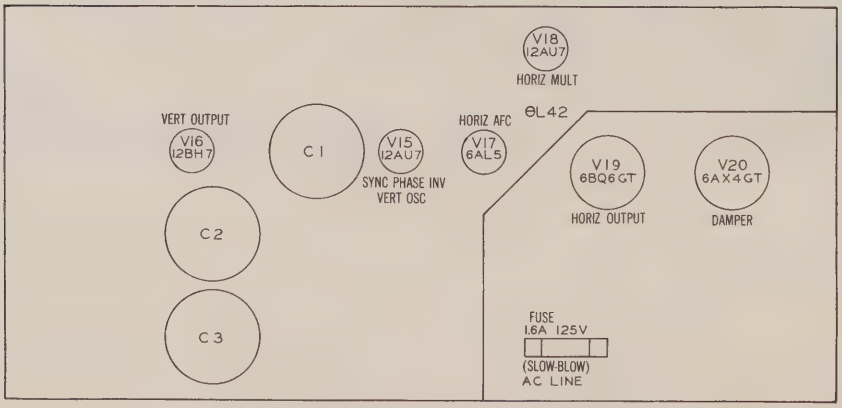
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BZ7	†1KΩ	1.1Meg	INF	0Ω	.1Ω	INF	560KΩ	0Ω	0Ω
V 2	12AZ7	†16KΩ	100KΩ	0Ω	.1Ω	.1Ω	†15KΩ	10KΩ	0Ω	0Ω
V 3	6CB6	110KΩ	68Ω	.1Ω	0Ω	†2.4KΩ	†2.4KΩ	0Ω		
V 4	6CB6	47KΩ	68Ω	.1Ω	0Ω	†2.2KΩ	†2.2KΩ	0Ω		
V 5	6CB6	.1Ω	150Ω	.1Ω	0Ω	†7.6KΩ	†7.6KΩ	0Ω		
V 6	6CB6	.1Ω	150Ω	.1Ω	0Ω	†2.2KΩ	†2.2KΩ	0Ω		
V 7	6U8	♦50KΩ	3.3KΩ	♦4.7KΩ	0Ω	.1Ω	♦8.9KΩ	33Ω	0Ω	2.7Meg
V 8	6AQ5	1.5Meg	650Ω	.1Ω	0Ω	†2.5KΩ	†0Ω	1.5Meg		
V 9	6AU6	♦60KΩ	♦0Ω	.1Ω	0Ω	350KΩ	†10KΩ	♦0Ω		
V 10	6BA6	1 Meg	♦100Ω	.1Ω	0Ω	†220Ω	†220Ω	22KΩ		
V 11	6AU6	100KΩ	0Ω	.1Ω	0Ω	†29KΩ	†29KΩ	0Ω		
V 12	6T8	INF	33KΩ	INF	.1Ω	0Ω	650KΩ	0Ω	32 Meg	†270KΩ
V 13	6L6GA	10Ω	0Ω	†586Ω	†400Ω	270KΩ	†0Ω	.1Ω	180Ω	
V 14	12AU7	♦22Meg	47KΩ	0Ω	0Ω	0Ω	♦175KΩ	♦22Meg	3.3KΩ	.1Ω
V 15	12AU7	▪1.3Meg	440KΩ	0Ω	.1Ω	.1Ω	†14KΩ	1 Meg	2.2KΩ	0Ω
V 16	12BH7	▪9KΩ	2.7Meg	47Ω	.1Ω	.1Ω	▪9KΩ	2.7Meg	47Ω	0Ω
V 17	6AL5	4.8Meg	4.8Meg	.1Ω	0Ω	15KΩ	INF	15KΩ		
V 18	12AU7	†57KΩ	145KΩ	1.2KΩ	.1Ω	.1Ω	†25KΩ	7 Meg	1.2KΩ	0Ω
V 19	6BQ6GT	1.3Meg	.1Ω	INF	†8KΩ	317KΩ	41Ω	0Ω	0Ω	Top Cap ▪30Ω
V 20	6AX4GT	†0Ω	INF	160KΩ	INF	†1.8Ω	.1Ω	0Ω	.1Ω	
V 21	1B3GT	PINS 1 - 8 HAVE INF RESISTANCE								Top Cap 820Ω
V 22	21EP4A	0Ω	470KΩ	Pin 10 ▪8.2KΩ	Pin 11 190KΩ	Pin 12 .1Ω				

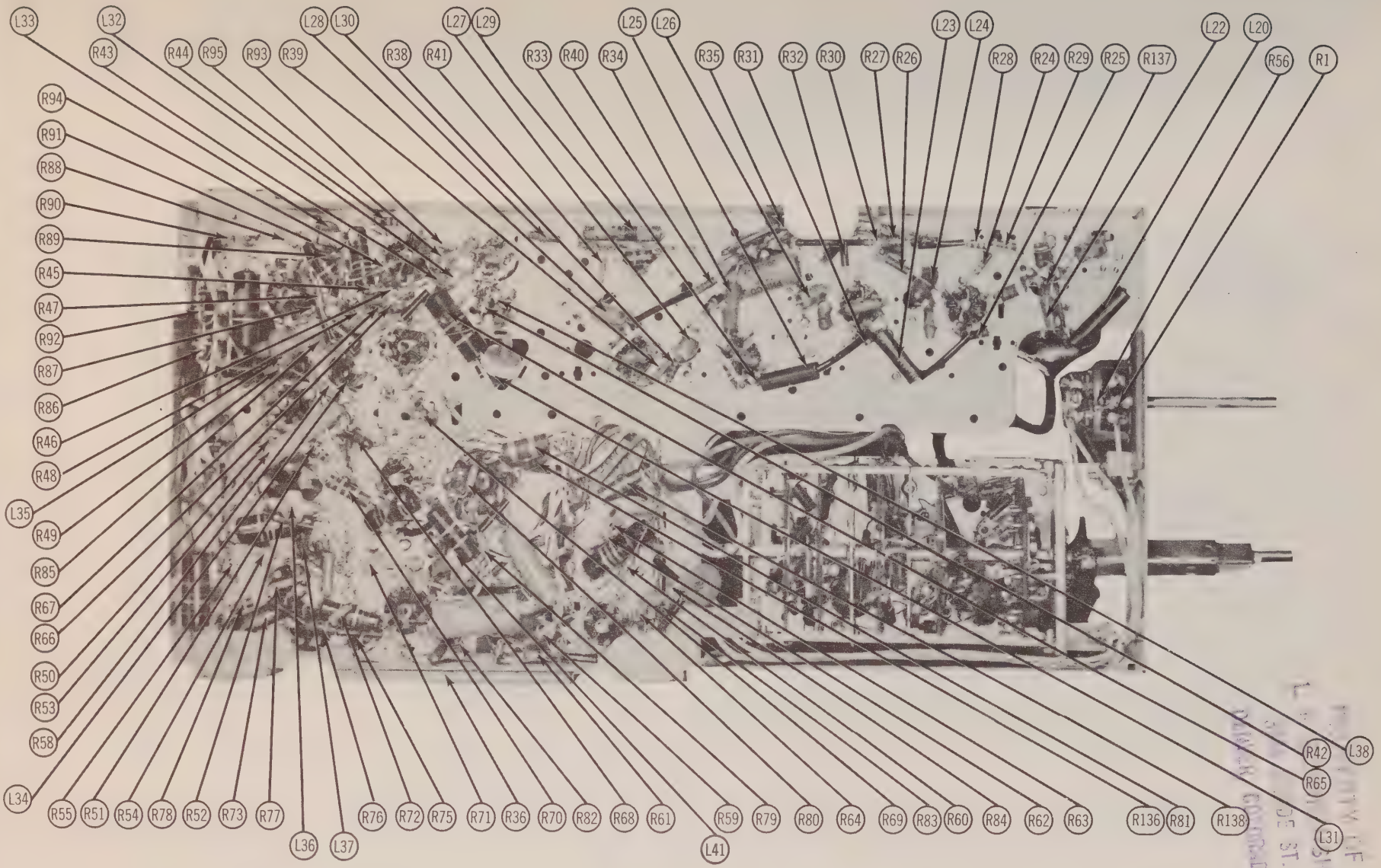
ALL MEASUREMENTS IN "TV" POSITION UNLESS OTHERWISE NOTED.
♦ MEASURED FROM 120VDC LINE.
† MEASURED FROM OUTPUT OF M1.
▪ MEASURED FROM PIN 3 OF V20.



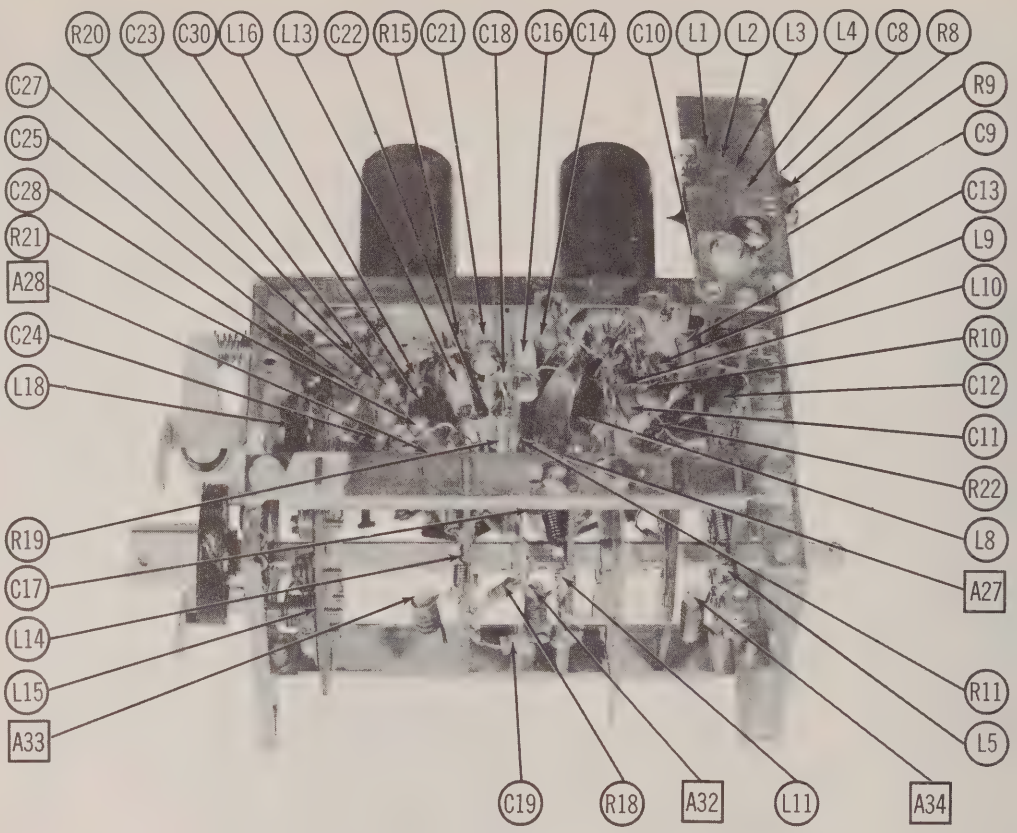
BOTTOM VIEW



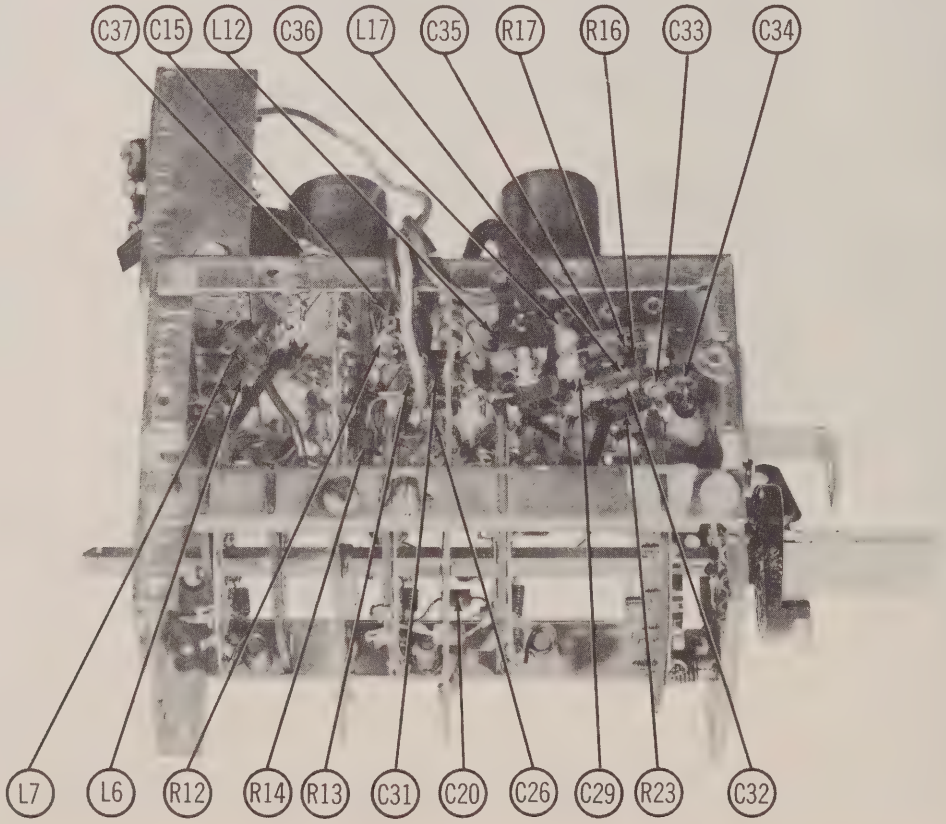
TUBE PLACEMENT CHART



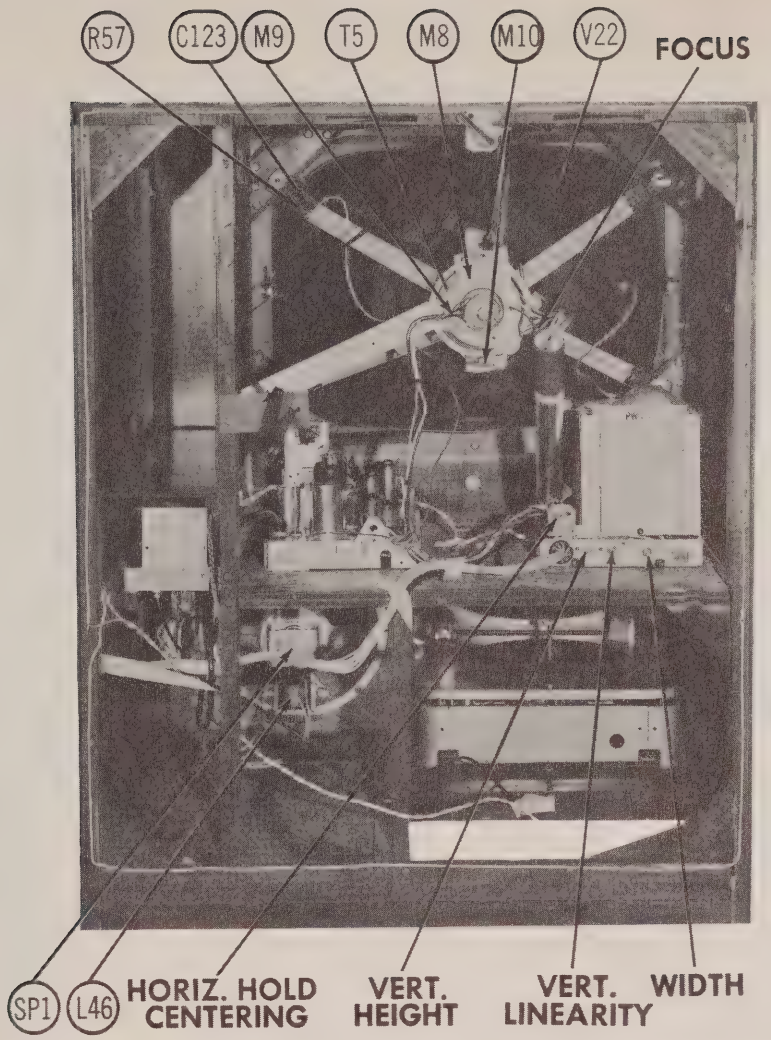
RF-IF CHASSIS-BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION



RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE



CABINET-REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

Reduce the picture width until approximately one inch of blank screen appears on each side of the picture.

Increase the brightness control setting until the blanking time becomes visible as indicated by a dark bar at each side of the picture.

Connect a .1MFD capacitor from pin 2 of the gate pulse socket to chassis.

Set the horizontal hold control at the center of its range.

Adjust the horizontal hold centering control until the picture is centered between the two blanking bars.

Remove the .1MFD capacitor.

Adjust the horizontal ringing coil slug (B1) until the picture is again centered between the two blanking bars.

Rotate the horizontal hold control through its range.

The picture should lose sync at both extremes of the rotation. If it does not, readjust the horizontal hold centering until that condition is obtained.

Check the number of diagonal bars on either side of the pull-in range of the horizontal hold.

There should be 1 or 2 bars present.

If proper pull-in is not obtained, repeat the above procedure.

TROUBLE SHOOTING AIDS

AC LINE ISOLATION

CAUTION

Both sides of the AC Line are connected to the chassis through branches of the voltage doubler network. Grounding the chassis will result in a direct short across C2 and speaker field, which are in series, or across C3A, R134, M3, and M1 which are in series from the other side of the AC line to chassis.
A line isolation transformer of at least 225 watts rating should be used. Failure to use an isolation transformer greatly increases the shock hazard and may result in damage to the test equipment and /or receiver.

SWEEP

HORIZONTAL

LOSS OF SWEEP

See "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V18, V19 and V20. Check setting of width control. Check waveform at W17.

If Satisfactory	If Unsatisfactory
Check C118, C119, C116, C117 and T3. Check yoke.	Check C114, C115 and other components associated with the horizontal oscillator and coupling circuit.

DRIVE LINES

Check by substitution V19 and V20. Check C114 and C115. Check components associated with V20. Check T3.

COMPRESSED LEFT SIDE

Check by substitution V19 and V20. Check C116 and C117. Check damper circuit components.

FOLDS

Check by substitution V18, V19 and V20. Check waveform at W16.

If Satisfactory	If Unsatisfactory
Check T3 and other components associated with the horizontal output stage.	Check horizontal oscillator and coupling circuits.

PIE CRUST EFFECT (Fig. 1)

This effect is the jagged outer edges of the test pattern as shown in Fig. 1 It is caused by C110 being open.

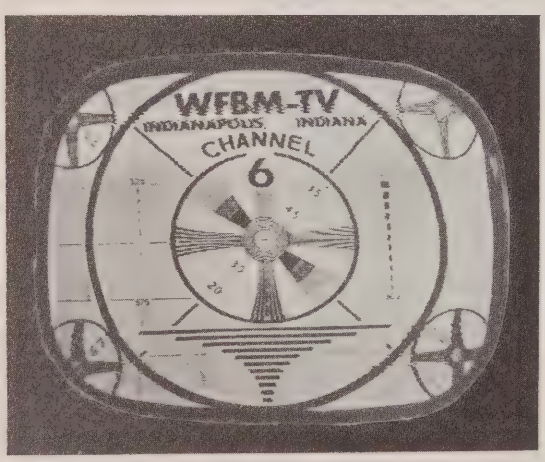


Fig. 1 PIE CRUST EFFECT
See HORIZ. SWEEP

VERTICAL

LOSS OF SWEEP

Check by substitution V15 and V16. Check waveform at W12.

If Satisfactory	If Unsatisfactory
Check R108, T4 and yoke.	Check C99, C100, T2 and other associated components.

INSUFFICIENT SWEEP

Substitute V15 and V16. Check C3B and R128. Proceed as outlined under "Loss of Sweep".

COMPRESSED AT BOTTOM

Check setting of height and vertical linearity controls. Substitute V15 and V16. Check C101, T4 and yoke.

COMPRESSED AT TOP

Substitute V15 and V16. Check C101 for leakage.

COMPRESSED AND FOLDED AT TOP EXPANDED BOTTOM (Fig. 2)

This condition as illustrated in Fig. 2 is caused by open vertical wave shaping capacitor, C98.

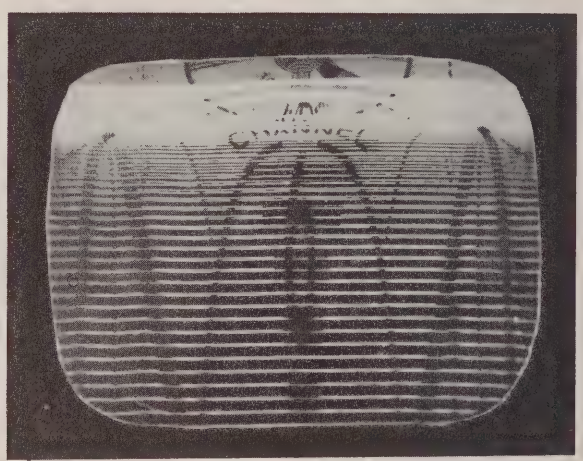
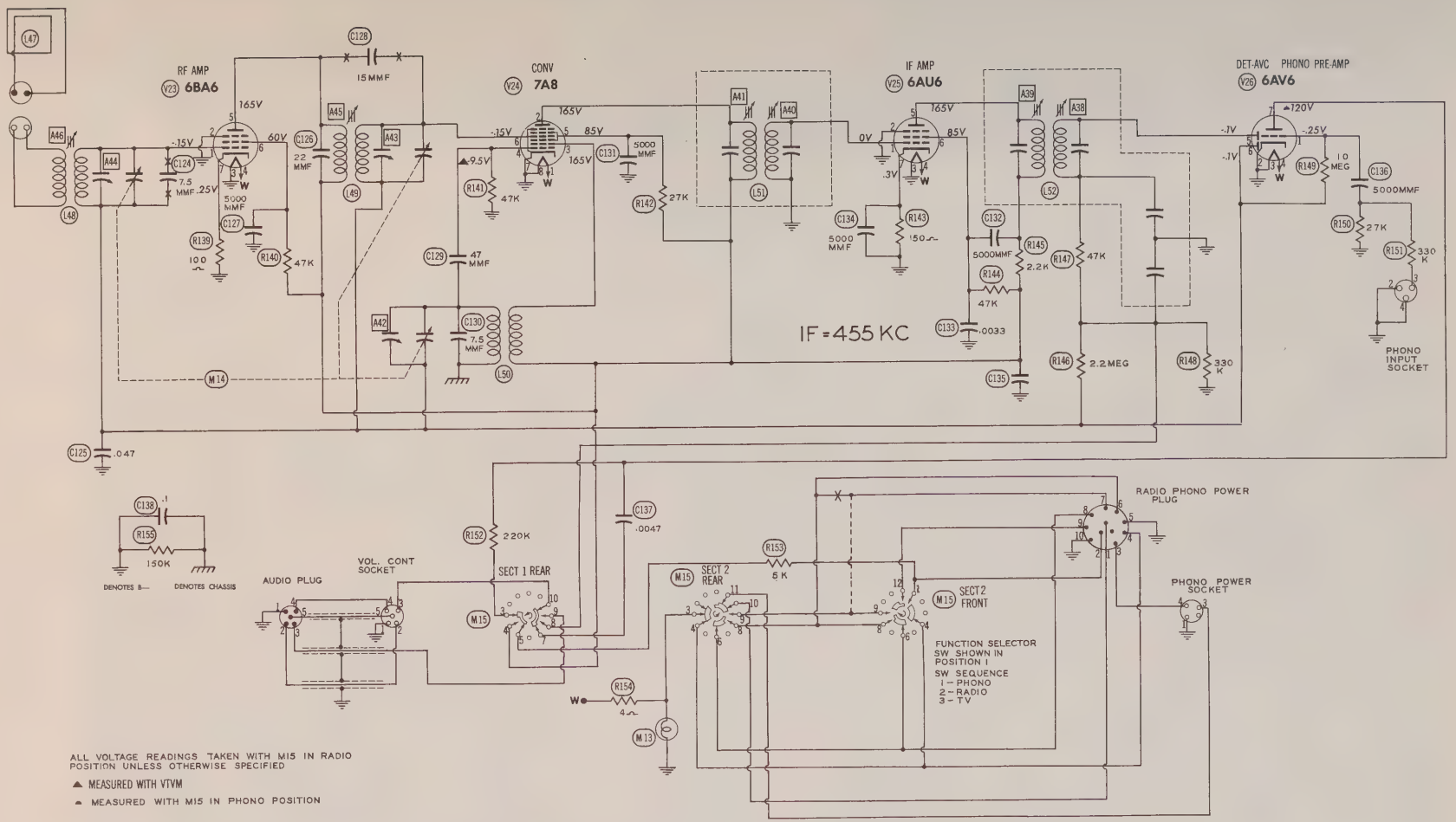


Fig. 2 COMPRESSED AND FOLDED AT TOP EXPANDED BOTTOM
See VERT. SWEEP

The Trouble-Shooting photographs shown above are made with permission of transmitting station WFBM-TV and in no way reflect the quality of the transmitted picture. Similarly, symptoms shown are assumed and are not indicative of the quality and workmanship of this receiving equipment.



ALL VOLTAGE READINGS TAKEN WITH M15 IN RADIO POSITION UNLESS OTHERWISE SPECIFIED

▲ MEASURED WITH VTVM

▲ MEASURED WITH M15 IN PHONO POSITION

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 23	6BA6	2.5Meg	0Ω	0Ω	.1Ω	†5KΩ	†52KΩ	47Ω	
V 24	7A8	.1Ω	†5KΩ	†5KΩ	47KΩ	†32KΩ	2.5Meg	0Ω	0Ω
V 25	6AU6	18Ω	0Ω	0Ω	.1Ω	†7.2KΩ	†52KΩ	150Ω	
V 26	6AV6	12Meg	0Ω	0Ω	.1Ω	375KΩ	2.5Meg	††225KΩ	

ALL MEASUREMENTS TAKEN IN RADIO POSITION.
† MEASURED FROM OUTPUT OF M1.
♦ MEASURED IN "PHONO" POSITION.

RADIO SCHEMATIC

PHILCO MODELS AT-2294 (Code 128), 53-12285, -L, 53-12286, 53-12287 (Code 126)

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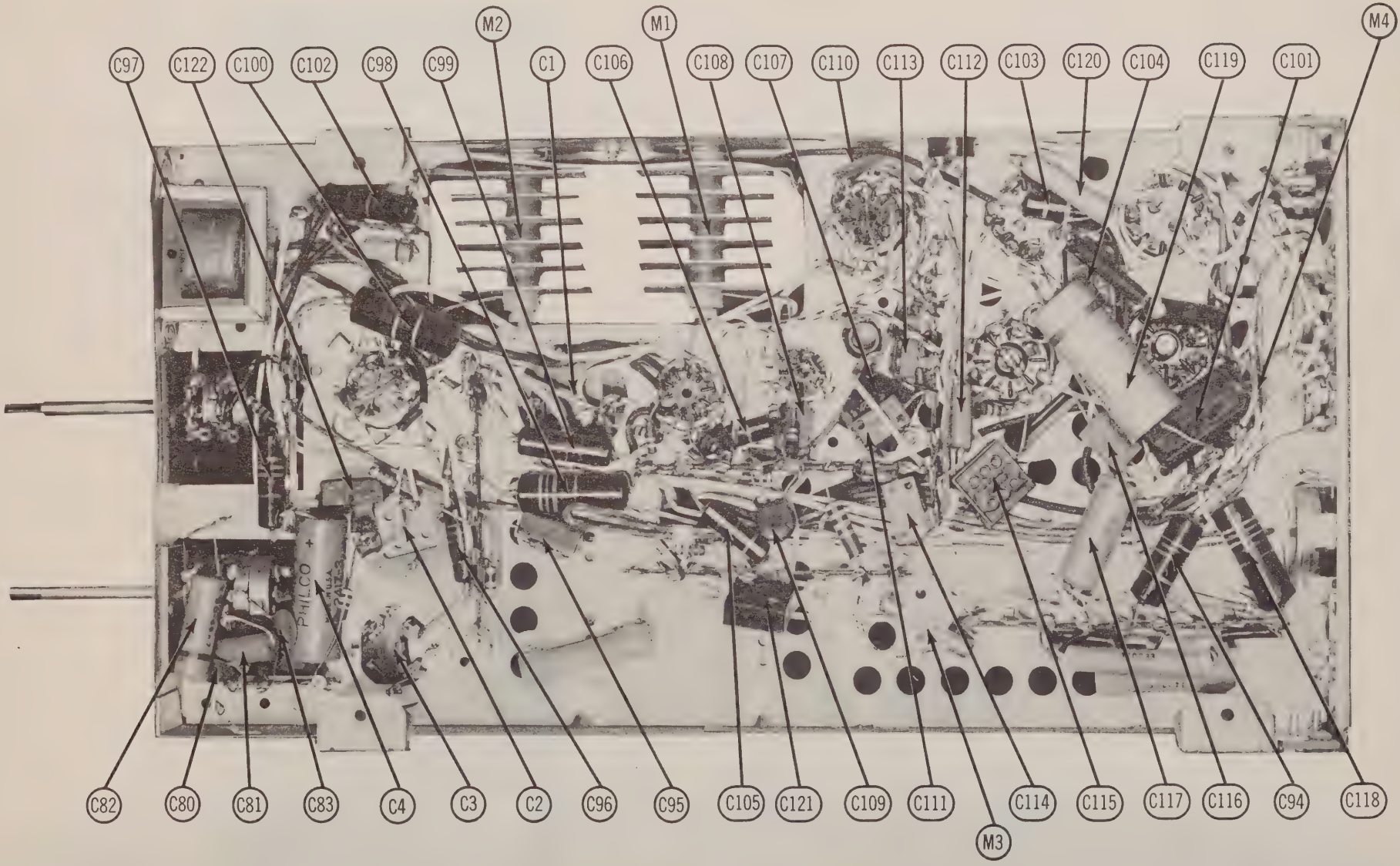


SWEEP CHASSIS-CAPACITOR IDENTIFICATION

TV PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: PHILCO PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RTMA BASE TYPE	NOTES
V1A	RF Amplifier	6BZ7	6BZ7	9AJ	
B	RF Amplifier	6BQ7	6BQ7	9AJ	
V2	Converter	12AZ7	12AZ7	9A	
V3	1st. Video IF Amp.	6CB6	6CB6	7CM	
V4	2nd. Video IF Amp.	6CB6	6CB6	7CM	
V5	3rd. Video IF Amp.	6CB6	6CB6	7CM	
V6	4th. Video IF Amp.	6CB6	6CB6	7CM	
V7	Video Amplifier-Sync Separator	6U8	6U8	9AE	
V8	Video Output	6AQ5	6AQ5	7BZ	
V9	AGC Keying	6AU6	6AU6	7BK	
V10	Sound IF Amp.	6BA6	6BA6	7BK	
V11	Limiter	6AU6	6AU6	7BK	
V12	Ratio Detector-AF Amplifier-AGC Clamper	6T8	6T8	9E	
V13	Audio Output	6L6GA	6L6GA	7S	
V14	Sync Limiter-Noise Inverter	12AU7	12AU7	9A	
V15	Sync Phase Inv.-Vert. Oscillator	12AU7	12AU7	9A	
V16	Vert. Output	12BH7	12BH7	9A	
V17	Horiz. AFC	6AL5	6AL5	6BT	
V18	Horiz. Mult.	12AU7	12AU7	9A	
V19	Horiz. Output	6BQ6GT	6BQ6GT	6AM	
V20	Damper	6AX4GT	6AX4GT	4CG	
V21	HV Rectifier	1B3GT	1B3GT	3C	

PROPERTY OF
NSHIP

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: PHILCO PART No.	REPLACEMENT DATA: SYLVANIA PART No.	RTMA BASE TYPE	NOTES
V22	21EP4A	21EP4A 21EP4 ① 21FP4 ① 21FP4A ①	12D 12D	① Circuit changes necessary

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C1	120	150	30-2568-51	AFHS1-73		XA007		FP140	TVL-1428	
C2	120	150	30-2568-51	AFHS1-73		XA007		FP140	TVL-1428	
C3A	■80	300	30-2584-20	AFH2-66		CO37		FP260		
B	▲40	475		PRS450/80				2N531		
C	▲10	300								
C4	10	50	30-2417-3	PRS250/12		BR105		TC32	TVA-1304	
C5A	■40	300	30-2584-24	AFH4-02		D112		FP476	TVL-4641	
B	10	300		PRS350/10				TC78		
C	▲10	300								
D	▲60	300								
C6	2	50	30-2417-7	E26E6		BBR2-50T		TC302	TVA-1301	
C7	2	50	30-2417-7	E26E6		BBR2-50T		TC302	TVA-1301	
C8	470		30-1225-18	SI470	D6-471	TM5T5	GP2K-471	UC-5347	5GA-T47	
C9	470		30-1225-18	SI470	D6-471	TM5T5	GP2K-471	UC-5347	5GA-T47	
C10	20		62-02030911				N330K-200			
C11	39		62-03949101				N330K-390			
C12	220		62-122001001	SI220	D6-221		GP2K-221	UC-5322	5GA-T22	
C13	220		62-122001001	SI220	D6-221		GP2K-221	UC-5322	5GA-T22	
C14	150		62-1150010 11	SII50	D6-151	TM5T15	GP2K-151	UC-5315	5GA-T15	
C15	10000		30-1238-2	BPD-01	DD-1032	TM5S1	811-01	DC-511	5HK-S1	
C16	.5-3		31-6520-3		829-3			CT565		
C17	150		62-11500101 1	BPD-00015	D6-151	TM5T15	GP2K-151	UC-5315	5GA-T15	
C18	1.5			SII.5NP0	TCZ-1.5		NP0K-1R5	ZT-5515	5TCCB-V15	
C19	1.4						NP0K-1R4			
C20	3.9						NP0K-3R9			
C21	.5-3		31-6520-7		829-3			CT565		
C22	39		62-03940901 1				N330K-390			
C23	1.5		30-1221-8	SII.5NP0	TCZ-1.5		NP0K-1R5	ZT-5515	5TCCB-V15	
C24	10			SII0N750	TCN-10		N750K-100	NT-541	5TCU-Q1	
C25	5		30-1224-5	SI5N750	TCN-5		N750K-050	NT-555	5TCUB-V5	
C26	800			BPD-0008	DD-801	TM5T8	801-001	DC-521	5GA-T8	
C27	220		62-122001001	SI220	D6-221		GP2K-221	UC-5322	5GA-T22	
C28	7.5		30-1224-8				NP0K-7R5			
C29	1-5		31-6520-11		829-6					
C30	220		62-122001001	SI220	D6-221		GP2K-221	UC-5322	5GA-T22	
C31	800			BPD-0008	DD-801	TM5T8	801-001	DC-521	5GA-T8	
C32	1.5		30-1221-8	SII.5NP0	TCZ-1.5		NP0K-1R5	ZT-5515	5TCCB-V15	
C33	1-5		31-6520-11		829-6					
C34	7.5		30-1224-8				NP0K-7R5			
C35	680		62-168001001	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C36	680		62-168001001	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C37	1000			CN-1-001	MFT-1000				503C-D1	
C38	10	500	60-00105417	1469-00001		5R5Q1		MCE215	MS-41	
C39	1-5		31-6520-9		829-6					
C40	5		30-1224-28				N330K-050			
C41	1-5		31-6520-9		829-6					
C42	1-5		31-6520-9		829-6					
C43	12						N330K-120			
C44	680		62-168001001	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C45	1-5		31-6520-9		829-6					
C46	1500			SII500	D6-152	TM5D15	GP2L-152	UC-5215	5HK-D15	
C47	680		62-168001001	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C48	1-5		31-6520-9		829-6					
C49	680		62-168001001	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C50	1500			SII500	D6-152	TM5D15	GP2L-152	UC-5215	5HK-D15	
C51	1-5		31-6520-9		829-6					

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (CONT.)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C52	2000			SI2000	D6-202	TMSD2	GP2-333-202	UC-522	5HK-D2	
C53	2000			SI2000	D6-202	TMSD2	GP2-333-202	UC-522	5HK-D2	
C54	680		62-168901001	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C55	1-5		31-8530-9		E25-6					
C56	2000			SI2000	D6-202	TMSD2	GP2-333-202	UC-522	5HK-D2	
C57	2000			SI2000	D6-202	TMSD2	GP2-333-202	UC-522	5HK-D2	
C58	5		30-1234-38				N330K-050			
C59	27		66-027409001				N330K-270			
C60	33		62-033009001				N330K-330			
C61	.015	200		P288-015		PTE68I5		TP400	67M-815	Note 1
C62	33		62-033009001				N330K-330			
C63	.047	200		P289-047	DF-503	PJ2S5		PT4147	2TM-347	
C64	.047	400		P488-047	DF-503	PTE4547		PT4147	4TM-347	
C65	.1	200		P288-1	DF-104	PJ2P1		PT401	2TM-P1	
C66	10000	500		1467-01	D6-103	TMS5I	GP2-333-103	MC475	5HK-51	
C67	.047	200		P289-047	DF-503	PJ2S5		PT4147	2TM-347	
C68	680		62-168901001	SI680	D6-681		GP2K-681	UC-5368	5GA-T68	
C69	2.2		30-1231-6	SI2.2NP0	TCZ-2.2		N90K-2R2		5TCCB-V22	
C70	18		62-018400021				N90K-180			
C71	1500			SI1500	D6-152	TMSD15	GP2L-152	UC-5215	5HK-D15	
C72	1500	500		1475-0015	D6-152	IW5D15	GP2L-152	MC256	1FM-215	
C73	.047	400		P488-047	DF-503	PTE4547		PT4147	4TM-347	
C74	56		30-1234-35	SI56N330			N330K-560			
C75	.0022	400		P688-0022	D6-222	PTE6D22	GP2-333-222	PT6222	6TM-D22	
C76	330		62-133001001	SI330	D6-331		GP2K-331	UC-5333	5GA-T33	
C77	330		62-133001001	SI330	D6-331		GP2K-331	UC-5333	5GA-T33	
C78	1500			SI1500	D6-152	TMSD15	GP2L-152	UC-5215	5HK-D15	
C79	.0022	400		P688-0022	D6-222	PTE6D22	GP2-333-222	PT6222	6TM-D22	
C80	10000			BPD-01	DD-1032	TMS5I	81L-01	DC-511	5HK-51	
C81	.01	200		P488-01	D6-103	PTE4SI	GP2-333-103	PT411	4TM-51	
C82	.03	400		P488-03		PTE4S3		PT413	6TM-33	Note 2
C83	5000			BPD-005	MD-502	TMSD5	81L-005	DC-535	5HK-D5	
C84	1500			SI1500	D6-152	TMSD15	GP2L-152	UC-5215	5HK-D15	
C85	10000			BPD-01	DD-1032	TMS5I	81L-01	DC-511	5HK-51	
C86	.01	400		P488-01	D6-103	PTE4SI	GP2-333-103	PT411	4TM-51	
C87	.01	400		P488-01	D6-103	PTE4SI	GP2-333-103	PT411	4TM-51	
C88	.0033	1000		P1088-0033		PTE15D33		PTE6233	MD-D33	
C89	.01	400		P488-01	D6-103	PTE4SI	GP2-333-103	PT411	4TM-51	
C90	10000			BPD-01	DD-1032	TMS5I	81L-01	DC-511	5HK-51	
C91	.1	200		P288-1	DF-104	PJ2P1		PT401	2TM-P1	
C92	.0047	800		P688-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	
C93	470		30-1225-7	SI470	D6-471	TMS7S	GP2K-471	UC-5347	5GA-T47	
C94	.047	400		P488-047	DF-503	PTE4547		PT4147	4TM-347	
C95	10000	400		1467-01	D6-103	TMS5I	GP2-333-103	MC475	5HK-51	
C96	.0022	400		P688-0022	D6-222	PTE6D22	GP2-333-222	PT6222	6TM-D22	
C97	.033	200		P289-033		PTE6S3		PT4133	2TM-33	
C98	.068	400		P488-068		PTE4S68			4TM-S68	
C99	.015	400		P488-015		PTE6S15		TP400	6TM-315	
C100	.1	400		P488-1	DF-104	PTE4P1		PT401	4TM-P1	
C101	100000	500		P888-1	DF-104	PTE5P1		PT501	5TM-P1	
C102	.015	400		P488-015		PTE6S15		TP400	6TM-315	
C103	.01	400		P488-01	D6-103	PTE4SI	GP2-333-103	PT411	4TM-51	
C104	47000	500		P888-047	DF-503	PTE5S47		PT5147	5TM-347	
C105	.001	400		P688-001	D6-102	PTE6D1	GP2L-102	PT621	6TM-D1	
C106	.0056	600		P688-0056	D6-562	PTE6D56	GP2L-562	PT6256	6TM-D56	
C107	10000	500		1467-01	D6-103	TMS5I	GP2-333-103	MC475	5HK-51	
C108	10000			BPD-01	DD-1032	TMS5I	81L-01 *	DC-511	5HK-51	
C109	1000			BPD-001	DD-103	TMS5D	80L-001	DC-531	5HK-D1	
C110	10000		30-1238-2	BPD-01	DD-1032	TMS5I	81L-01	DC-511	5HK-51	
C111	82	500								
C112	2200	500								
C113	390	500	60-103954I7	1469-0004		5RST4		MCB243	MS-34	
C114	390	500	60-103954I7	1469-0004		5RST4		MCB243	MS-34	
C115	4700	600		P688-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	
C116	100	500	60-00835317	1469-0001		5RST1		MCB235	MS-31	
C117	.047	400		P488-047	DF-503	PTE4547		PT4147	4TM-347	
C118	.047	800		P688-047		PTE6S47		PT6147	6TM-S47	
C119	.5	100		P288-5		PJ2P5		PT505	2TM-P5	
C120	6.8	2000		HVD30-0008-6S				MCL468	30GA-Q68	
C121	10000	500		5892X-01		PJ6S1		PT611	6TM-S1	
C122	10000	500		5892X-01		PJ6S1		PT611	6TM-S1	
C123	.01	600		P688-01		PTE6S1		PT611	6TM-S1	

Note 1, Not used in all Models.
Note 2. Some Models may use .01MFD or .05MFD in this application.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA PHILCO PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	* INSTALLATION NOTES
R1A	2500Ω	2	33-5563-51	QJ-357*	RTV-359		WF252	Contrast-Wire Wound-Panel
B	100KΩ	½					UR15L	Brightness-Rear
R2A	50KΩ	½	33-5563-50	QJ-356**	RTV-358	SBB-718	UF54L }	Horiz. Hold-Panel
B	250KΩ	½					UR354L } †	Vert. Hold-Rear
R3A	5 Meg	½	33-5563-44	QJ-340‡	RTV-360	SBBT-652-S	UF10L	Tone-Panel
B	2 Meg	½					UR26T95	Volume Tap@ 1 Meg-Rear
C	Switch						US-28	Attach to R3B
R4A	250KΩ	1	33-5565-17	QH-130	AG-55-S	AB-50	SU-46	Horiz. Hold Centering
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Not Req.	Attach to R4A
R5A	5 Meg	½	33-5565-31	QH-141	AG-85-S	AB-87	SU-67	Height
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Not Req.	Attach to R5A
R6A	5 Meg	½	32-5565-31	QH-141	AG-85-S	AB-87	SU-67	Vert. Linearity
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Not Req.	Attach to R6A
R7A	10KΩ	2	33-5546-41	WK-10000	A48-10K		R10000A	Width-Wire Wound
B	Shaft		Not Req.	Not Req.	FKS-1/4		Not Req.	Attach to R7A

* CONCENTRIKIT EQUIVALENT-KIT K-3, BASE ELEMENTS & SHAFTS W17-111 & P3-121 (Panel) B11-128 & R1-216 (Rear).
** CONCENTRIKIT EQUIVALENT-KIT K-2, BASE ELEMENTS & SHAFTS B11-123 & P1-200(Panel) B11-130 & R1-216 (Rear).
‡ CONCENTRIKIT EQUIVALENT-KIT K-2, BASE ELEMENTS & SHAFTS B12-141 & P1-200 (Panel) B18-139 X & R1-216 (Rear) & SWITCH 76-1.
† UNIVERSAL REPLACEMENT-(MALLORY EXACT DUPLICATE PART NO. UE966).

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA PHILCO PART No.	IRC PART No.	NOTES
R8	1 Meg	½		BTS-1 Meg	
R9	1 Meg	½		BTS-1 Meg	
R10	10KΩ	½		BTS-10K	
R11	10000Ω	½		BTS-10000	Note 1
R12	2.2Meg	½			
R13	2.2Meg	½			
R14	10000Ω	½		BTS-10000	
R15	100KΩ	½			
R16	12KΩ	½		BTS-12K	
R17	10000Ω	½		BTS-10000	
R18	8200Ω	½		BTS-8200	
R19	820Ω	½		BTS-820	
R20	10KΩ	½			
R21	15KΩ	1			
R22	1000Ω	½		BTS-1000	
R23	100	½			
R24	15KΩ	½		BTS-15K	
R25	68Ω	½		BTS-68	
R26	220Ω	½		BTS-220	
R27	47K Ω	½		BTS-47K	
R28	47KΩ	½		BTS-47K	
R29	47KΩ	½		BTS-47K	
R30	39KΩ	½		BTS-39K	
R31	68Ω	½		BTS-68	
R32	220Ω	½		BTS-220	
R33	150Ω	2		BTS-150	
R34	5600Ω	1		BTA-5600	
R35	220Ω	½		BTS-220	
R36 A	2000Ω	7	33-3446-8		
B	400Ω	2.6			
R38	82000Ω	½			
R39	150Ω	½		BTS-150	
R40	220Ω	½		BTS-220	
R41	12KΩ	½		BTS-12K	Note 1
R42	3300Ω	½		BTS-3300	
R43	12KΩ	½		BTS-12K	Note 2
R44	33Ω	½		BTS-33	
R45	4700Ω	½		BTS-4700	
R46	47KΩ	½		BTS-47K	
R47	3300Ω	½		BTS-3300	
R48	4700Ω	½		BTS-4700	
R49	8200Ω	½		BTS-8200	
R50	1.5Meg	½		BTS-1.5Meg	
R51	330KΩ	½		BTS-330K	
R52	8200Ω	½		BTS-8200	
R53	3500Ω	½	33-1335-93		
R54	470KΩ	½		BTS-470K	
R55	180KΩ	½		BTS-180K	
R56	22KΩ	½		BTS-22K	
R57	470KΩ	1	66-4474340	BTA-470K	
R58	47KΩ	½		BTS-47K	
R59	560KΩ	½		BTS-560K	
R60	5.6Meg	½		BTS-5.6Meg	
R61	10KΩ	½		BTS-10K	
R62	470KΩ	½		BTS-470K	
R63	10KΩ	½		BTS-10K	
R64	47KΩ	½		BTS-47K	
R65	1 Meg	½			
R67	100Ω	½		BTS-100	
R68	220Ω	½		BTS-220	
R69	100KΩ	½		BTS-100K	
R70	27KΩ	1	66-3274340	BTA-27K	
R71	270Ω	½		BTS-270	
R72	22KΩ	½		BTS-22K	
R73	33KΩ	½		BTS-33K	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA PHILCO PART No.	IRC PART No.	NOTES
R74	68KΩ	½		BTS-68K	
R75	15KΩ	½		BTS-15K	
R76	10Meg	½		BTS-10Meg	
R77	22Meg	½		BTS-22Meg	Note 1
R78	10Meg	½		BTS-10Meg	
R79	270KΩ	½		BTS-270K	
R80	270KΩ	½		BTS-270K	
R81	180Ω	3	66-1185340		
R82	*	*	33-1354		
R83	330KΩ	½		BTS-330K	
R84	2200Ω	½		BTS-2200	
R85	47KΩ	½		BTS-47K	
R86	33KΩ	½		BTS-33K	
R87	22Meg	½		BTS-22Meg	
R88	3300Ω	½		BTS-3300	
R89	10KΩ	½		BTS-10K	
R90	220KΩ	½		BTS-220K	
R91	470KΩ	½		BTS-470K	
R92	68KΩ	½		BTS-68K	
R93	2.7Meg	½		BTS-2.7Meg	
R94	150KΩ	½		BTS-150K	
R95	47KΩ	½		BTS-47K	
R96	1 Meg	½		BTS-1 Meg	
R97	2200Ω	½		BTS-2200	
R98	10KΩ	½		BTS-10K	
R99	3900Ω	½		BTS-3900	
R100	22KΩ	½		BTS-22K	
R101	4700Ω	½		BTS-4700	
R102	220KΩ	½		BTS-220K	
R103	56KΩ	½		BTS-56K	
R104	330KΩ	½		BTS-330K	
R105	5600Ω	½		BTS-5600	
R106	1 Meg	½		BTS-1 Meg	
R107	1 Meg	½		BTS-1 Meg	
R108	47Ω	½		BTS-47	
R109	100Ω	½			
R110	100KΩ	1		BTA-100K	Note 1
R111	1000Ω	½		BTS-1000	
R112	1000Ω	½		BTS-1000	
R113	10KΩ	½		BTS-10K	
R114	100KΩ	½		BTS-100K	
R115	100KΩ	½		BTS-100K	
R116	4.7Meg	½		BTS-4.7Meg	
R117	2.2Meg	½		BTS-2.2Meg	
R118	1300Ω	½		BTS-1300	
R119	15KΩ	½		BTS-15K	
R120	56KΩ	½		BTS-56K	
R121	47KΩ	½		BTS-47K	
R122	10KΩ	½		BTS-10K	
R123	10KΩ	½		BTS-10K	
R124	1 Meg	½		BTS-1 Meg	
R125	270KΩ	½		BTS-270K	Note 3
R126	4200Ω	5	33-1335-101	1 3/4A-4000	
R127	47KΩ	1	66-3474340	BTA-47K	
R128	6200Ω	7	33-3448-19	1 3/4A-6000	
R129	33KΩ	2		BTB-22K	Note 4
R130	27KΩ	½		BTS-27K	
R131	470Ω	½		BTS-470	
R132	2.7Ω	1	66-9274360		
R133	47KΩ	½		BTS-47K	
R134	5Ω	10	33-3448-5		
R135	.24Ω	½	41-4149		
R136	10Ω	½		BTS-10	
R137	15KΩ	½		BTS-15K	
R138	15KΩ	1	66-3154340	BTA-15K	

·Note 1. Not used in all models.
Note 2. Some models may use a 2000Ω resistor in this application.
Note 3. Some models may use a 470KΩ resistor in this application.
Note 4. Some models may use a 22KΩ resistor in this application.
* Special resistor order only by part number.
† Short piece of wire.

TRANSFORMER (FILAMENT)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA PHILCO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No	TRIAD PART No.	RCA TYPE No.
T1	117VAC	6.7VAC @6.2A	6.7VAC @4.1A		32-8575			FV-6564		

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING DC RESISTANCE PRI.	RATING DC RESISTANCE SEC.	REPLACEMENT DATA PHILCO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.	NOTES
T2	170Ω	325Ω	32-8431-3	A-8126 ①		TSO-4			Vert. Osc.Trans.
			32-8431-2 ①						
T3	880Ω@ 25Ω, 500, 800 @13Ω	30Ω SEC. 2 0Ω	32-8565						Horiz. Output Trans.
T4	960Ω@ 13Ω		32-8577-1	A-8113 ②	A-3037	TSO-20	A-92X ②③	204T2 ② ③	Vert. Output Trans.
T5 A	44Ω		32-9468	DY-12A ⑤	MDY-71 ⑤	TY-8 ⑤	Y-34 ⑤		Horiz. Deflection Coils
B	47Ω								Vert.Deflection Coils

① Alternate vert, osc. trans.
② Connect as auto transformer
③ Drill new mounting holes.
④ Drill one new mounting hole .
⑤ Use original deflection coil network.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING IMPEDANCE PRI.	RATING IMPEDANCE SEC.	RATING DC RES. PRI.	RATING DC RES. SEC.	REPLACEMENT DATA PHILCO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	NOTES
T6	2.7KΩ	3.3Ω	186Ω	.6Ω	32-8579	A-3823	A-2928 ①	RO-304 ①	S-IX ①	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V C IMP	REPLACEMENT DATA PHILCO PART No.	VIKING PART No	QUAM PART No.	NOTES
SP1	10"	PM	3.1Ω	32-1646-9	10J11	10A31	Some Models use EM speakers, speaker field used as choke.

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Ant. Trans.	.7Ω	.7Ω	32-4432-1				
L2	Ant. Trans.	.7Ω	.7Ω	32-4432-1				
L3	FM Trap	0Ω		32-4550-3				Wound on 22MMF Cap. Includes switch wafer
L4	IF Trap	0Ω		32-4552-1				
L5	Ant. Coils	0Ω		76-7610				
L6	40MC Input Coil	0Ω		32-4550-5				
L7	40MC Input Coil	0Ω		32-4550-6				
L8	Fil, Choke	0Ω		32-4550-1				
L9	Neutr.Coil	.3Ω		32-4551-1				
L10	RF Coupling	0Ω		32-4550-9				
L11	RF Coils	0Ω		76-7608				Includes switch wafer
L12	Fil. Choke	0Ω		32-4550-1				
L13	Feedback Coil	.8Ω		32-4551-1				
L14	Mixer Grid Coils	0Ω		76-7606				Include s switch wafer
L15	Osc. Coils	0Ω		76-7604				Includes switch wafer
L16	RF Choke	0Ω		32-4550-4				
L17	RF Choke	.3Ω		32-5151-6				
L18	IF Trap	.2Ω		32-5151-5				
L19	Video IF Input Trans.	0Ω	0Ω	32-4548-23				
L20	47.25MC Trap	.6Ω		32-4548-15			4606	
L21	41.25MC Trap	.05Ω		32-4113-31			4604	
L22	Video IF Coupling	.6Ω		32-4112-31			4604	
L23	Fil. Choke	.1Ω		32-4112-15			4606	2.9 Microhenries
L24	1st.Video IF	.1Ω	.1Ω	32-4548-24				
L25	Fil. Choke	.1Ω		32-4112-15			4606	2.9 Microhenries
L26	2nd.Video IF	.1Ω	.1Ω	32-4548-25				
L27	3rd.Video IF	.1Ω	.1Ω	32-4548-26				
L28	4th.Video IF	.1Ω	.1Ω	32-4548-18				
L29	Series Peaking Coil	8.2Ω		32-4422-37			4612	10 Microhenries, (IRC part #CL-1)
L30	Series Peaking Coil	.3Ω		32-4143-23			4606	3 Microhenries
L31	Shunt Peaking Coil	7Ω		32-4480-5	19-1933	TV-186	4648	400 Microhenries
L32	Series Peaking Coil	4.5Ω		32-4480-9	19-3180	TV-184	6180	180 Microhenries
L33	4.5MC Trap	4Ω		32-4483-8	20-1004	TV-151	1470	
L34	Variable Shunt Peaking Coil	12Ω		32-4467-11				270-700 Microhenries
L35	Series Peaking Coil	5.2Ω		32-4480-4	19-3250	TV-185	6181	250 Microhenries
L36	Series Peaking Coil	4.5Ω		32-4480-9	19-3180	TV-184	6180	180 Microhenries
L37	Variable Shunt Peaking Coil	5.2Ω		32-4467-7				50-170 Microhenries
L38	1st.Sound IF	4Ω		32-4483-9	I7-3400	TV-151	1469	
L39	2nd.Sound IF	1.9Ω	1.9Ω	32-4449A		TV-113	6203	
L40	Ratio Det.	5Ω	.75CT	32-4450-5	I7-3497	TV-115	6205	Tertiary winding-.75Ω
L41	Fil. Choke	.1Ω		32-4112-15			4606	2.9 Microhenries
L42	Horiz. Osc.	170Ω		32-4557	19-1576	TV-163	6210	
L43	RF Choke	1.8Ω						Part of Horiz. Output Trans., T3
L44	RF Choke	1.8Ω		32-4112-34			4612	11.4 Microhenries
L45	RF Choke	1.8Ω		32-4112-24			4612	11.4 Microhenries

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE @ CURRENT (100V %)	REPLACEMENT DATA PHILCO PART No.	STANCOR PART No	MERIT PART No	CHICAGO PART No	TRIAD PART No
L46	.300ADC	41Ω	1.3 Hy.	32-8805 ①	C-2326 ①	C-2996 ①	TR-1733 ①	C-17X ①

① Drill one new mounting hole.
② Mounted on speaker frame.

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT	REPLACEMENT DATA PHILCO PART No.	SYLVANIA PART No.	SELETRON PART No.	FEDERAL PART No.	MALLORY PART No.	SARKES TARZIAN PART No.
M1	.300ADC	34-8003-7	NH-5	8Q84	1023A	68350	350
M2	.300ADC	34-8003-7	NH-5	8Q84	1023A	68350	350

PHILCO MODELS AT-2294 (Code 128), 53-T2285, -L, 53-T2286, 53-T2287 (Code 126)

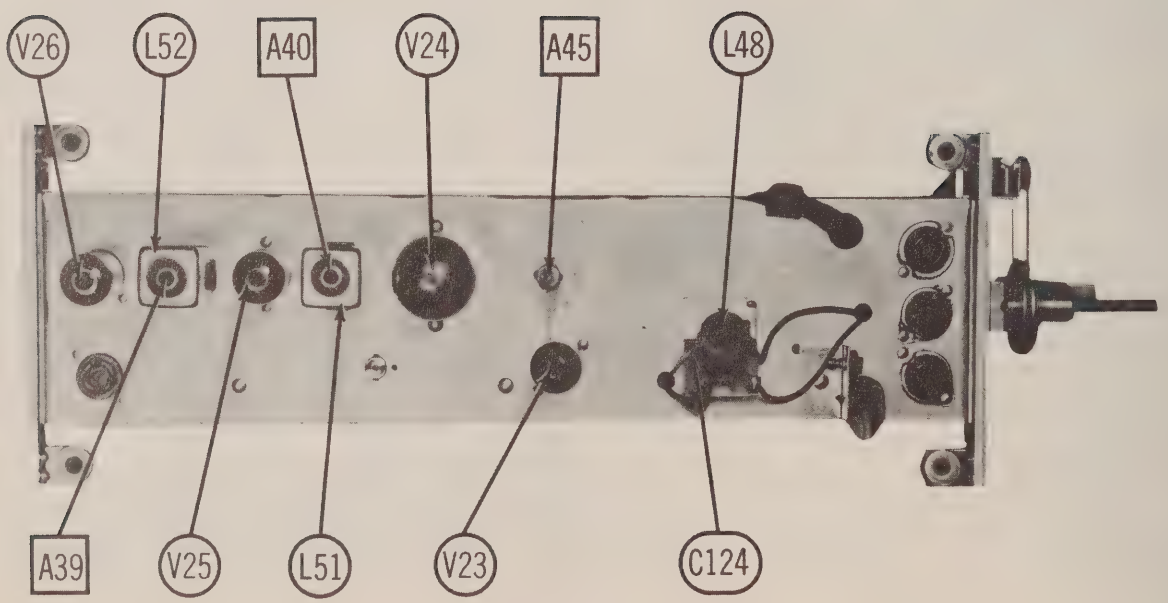
TV PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			PHILCO PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M3 M4	3AG (Slo-Blo) 1 5/8"of #22 wire	1 6/10A @125V	45-2656-23		31501.6		MDV 1 6/10	

MISCELLANEOUS

ITEM No.	PART NAME	PHILCO PART No.	NOTES
M5	Pilot Light		Type #47
M6	RF Tuner	76-7600	
M7	Crystal Diode	34-8022	Video Detector (1N64)
M8	Focus Magnet	76-6126-4	(Includes Centering Device)
M9	Ion Trap	76-6077-2	
M10	Correction Magnet	76-6594	(2 Used)



RADIO CHASSIS–TOP VIEW

RADIO PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RTMA BASE TYPE	NOTES
		PHILCO PART No.	STANDARD REPLACEMENT		
V23	RF Amplifier	6BA6	6BA6	7BK	
V24	Converter	7A8	7A8	8U	
V25	IF Amplifier	6AU6	6AU6	7BK	
V26	Detector-AVC-Phono Pre-Amp.	6AV6	6AV6	7BT	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C124	7.5		30-1224-65							Note 1
C125	.047	200		P288-047	DF-503	PJ2S5		PT4147	2TM-S47	
C126	22		62-022009001				N330K-220			
C127	5000		30-1238-1	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C128	15			SI15NP0	TCZ-15		NP0K-150		5TCC-Q15	Note 1
C129	47		60-00475420	SI47N330			N330K-470			
C130	7.5		30-1224-65							
C131	5000		30-1238-1	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C132	5000		30-1238-1	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C133	.0033	400		P688-0033	D6-332	PTE6D33	GP2-333-332	PT6233	6TM-D3	
C134	5000		30-1238-1	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C135	.1	400		P488-1	DF-104	PTE4P1		PT401	4TM-P1	
C136	5000		30-1238-1	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C137	.0047	600		P688-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	
C138	.1	400		P488-1		PTE4P1		PT401	4TM-P1	

Note 1. Not used in all Models.

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PHILCO PART No.	IRC PART No.	
R139	100Ω	1/2		BTS-100	Note 1
R140	47KΩ	1/2		BTS-47K	Note 2
R141	47KΩ	1/2		BTS-47K	
R142	27KΩ	1/2		BTS-27K	Note 3
R143	150Ω	1/2		BTS-150	
R144	47KΩ	1/2		BTS-47K	
R145	2200Ω	1/2		BTS-2200	
R146	2.2Meg	1/2		BTS-2.2Meg	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PHILCO PART No.	IRC PART No.	
R147	47KΩ	1/2		BTS-47K	
R148	330KΩ	1/2		BTS-330K	Note 4
R149	10Meg	1/2		BTS-10Meg	
R150	27KΩ	1/2		BTS-27K	
R151	330KΩ	1/2		BTS-330K	
R152	220KΩ	1/2		BTS-220K	
R153	5000Ω	5	33-1335-118	1 3/4A-5000	
R154	.4Ω	*			
R155	150KΩ	1/2		BTS-150K	

Note 1. Some models may use a 47Ω resistor in this application.
Note 2. Some models may use a 33KΩ resistor in this application.
Note 3. Some models may use a 47KΩ resistor in this application.
Note 4. Some models may use a 470KΩ resistor in this application.
* Special resistor- 46 inches of No. 26 copper weld wire.

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L47	AM Loop Ant.	0Ω						
L48	Ant. Coil	.3Ω	3.4Ω	32-4519				
L49	RF Coil	90Ω	6.5Ω	32-4572-1				
L50	Osc. Coil	1.9Ω	7.5Ω	32-4453-4	14-1040		71-Osc.	
L51	Input IF	26Ω	19Ω	32-4537A	16-6758	BC-352	12-C1	
L52	Output IF	16Ω	16Ω	32-4517-1A	16-6770	BC-355	12-C6	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA						REMARKS
	PHILCO PART No.	ASTATIC PART No.		SHURE PART No.		ELECTRO-VOICE PART No.	
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M11	45-9612							

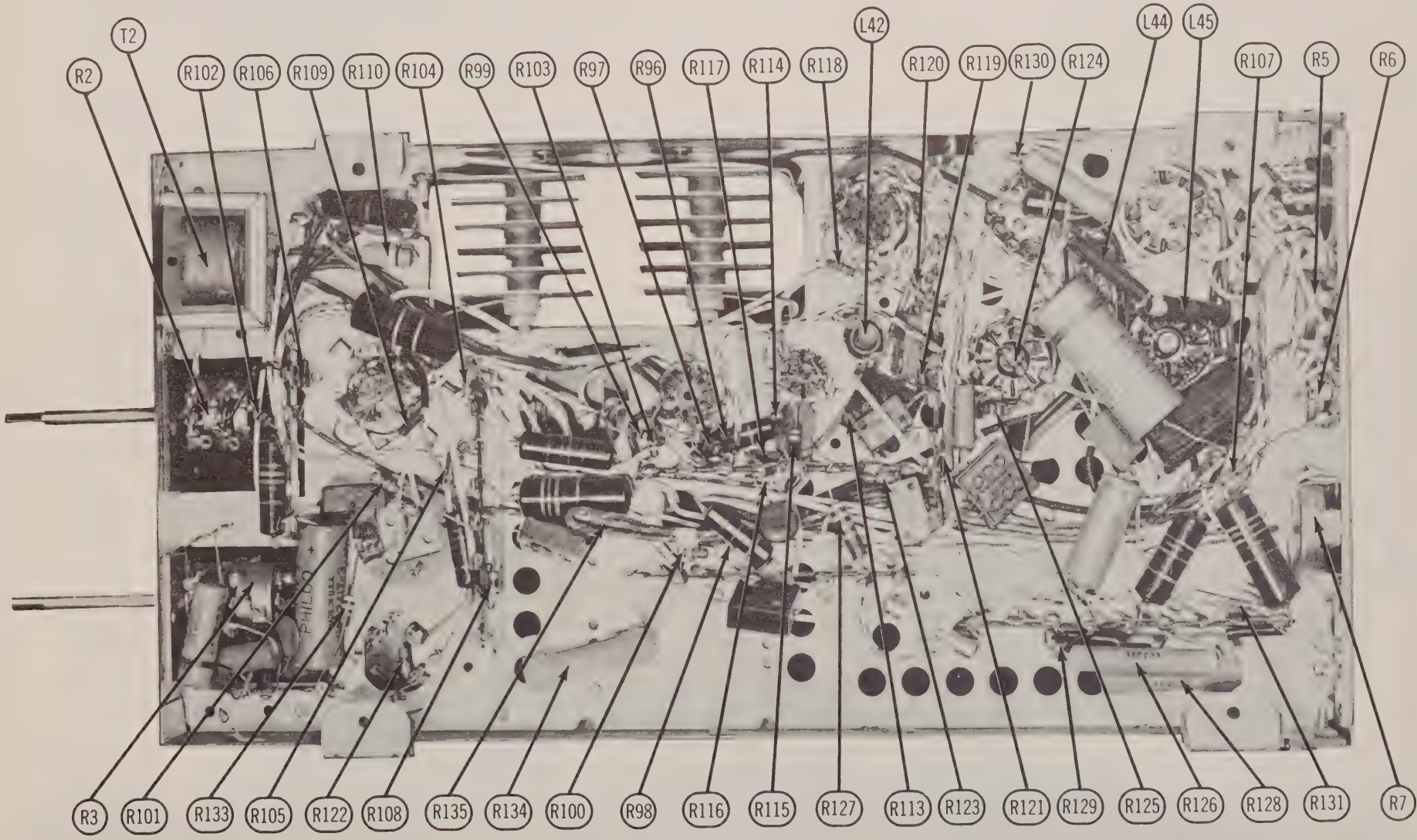
PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	PHILCO PART No.	WALCO PART No.	JENSEN PART No.	
M12	45-9588	W-46TPS	PH-12 or PH-13	

MISCELLANEOUS

ITEM No.	PART NAME	PHILCO PART No.	NOTES
M13	Pilot Light	34-2064	Type #44
M14	Tuning Capacitor	31-2766-1	35-487MMF, 34-487MMF, 120-165MMF
M15	Switch	42-1992	Function Selector



SWEEP CHASSIS-BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION

TROUBLE SHOOTING AIDS (CONT.)

SYNC

HORIZONTAL

LOSS OF SYNC

Substitute V17 and V18. Check waveform at W14.

If Satisfactory	If Unsatisfactory
Check R116, R117, C109 and C110. Check other associated components.	Check R113, R127, C107, C108, C105, C106 and other associated circuit components.

CRITICAL SYNC

Substitute V7, V14, V15, V17 and V18. Follow procedure outlined under "Loss of Sync".

VERTICAL

LOSS OF SYNC

Substitute V15, V14 and V7. Check signal at W10, W11.

If Unsatisfactory	If Satisfactory
Check vertical integrator network, T2 and other associated circuit components.	Check C100, R104 and other associated components.

CRITICAL SYNC

Substitute V15, V14 and V7. Check waveform at W2 for signal overload and sync compression.

If Satisfactory	If Unsatisfactory
Proceed as outlined under "Loss of Sync".	Trace signal to point of overload and check components of that stage.

TRIGGERING

Substitute V15, V14 and V7. Check circuit near these stages for filament lead dress.

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DENVER, COLORADO

VIDEO

LOSS OF VIDEO

Substitute V7 and V8. Check signal at W2.

If Satisfactory	If Unsatisfactory
Check C64, L36, picture tube and other associated components.	Check L35, L33, C63, C62, C60, R45, R46, R47 and R48. Check other associated components.

SOUND BARS

Check adjustment of local oscillator. Check 4.5MC trap adjustment. Check video IF alignment.

POOR RESOLUTION

Check by substitution V1, V2, V3, V4, V5 and V6. Check video detector assembly. Check video IF alignment.

POOR CONTRAST

Check by substitution V7 and V8.
Check C5A, C63 and C64. Check video detector assembly.

SMEAR

Check by substitution V7 and V8. Check C63 and C64 for leaky. Check L35 and L36 for open. Check R45, R48 and R53 for change of value. Check other associated components. Check picture tube.

ONE WIDE BLACK BAR ACROSS PICTURE

Check tuner, video IF and video amplifier tubes for heater to cathode leakage. Check for filament lead dress in video IF and amplifier stages.

AUDIO

WEAK OR NO SOUND

Check by substitution V10, V11, V12 and V13.
Check stages of V12B and V13 by shorting momentarily pin 8 of V12 to ground. A loud noise should result.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF alignment and components.	Check components associated with V12B and V13.

BUZZ

Realign ratio detector. If buzz is still objectionable substitute V12 and readjust A13 and A14.

DISTORTED

Check by substitution V10, V11, V12 and V13. Check stages of V12B and V13 using audio signal generator.

If Distorted	If Undistorted
Check components associated with V12B and V13 especially C87, T6 and speaker.	Check ratio detector and audio IF alignment. Check components associated with these stages.

POWER

SMALL RASTER WEAK SOUND

Measure B+. If low, substitute M1 and M2. Check C1, C2, C3, and C5.

DIM PICTURE

Measure B+. If low, proceed as outlined under "Small Raster Weak Sound". Check picture tube.

CONTINUED ON PAGE 22

TROUBLE SHOOTING AIDS (CONT.)

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V18, V19, V20 and V21.
Check waveform at W17.

If Satisfactory	If Unsatisfactory
Check R132, C118, C117, C116, T3, yoke and other associated components.	Check C114, C115, C13 and other associated circuit components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V18, V19, V20 and V21. Measure B+.

If Low	If Satisfactory
Proceed as outlined under "Dim Picture".	Proceed as outlined under "Loss of High Voltage".

BLOOMING

Check by substitution V19, V20, V21 and V18. Check R132 and T3.
Check picture tube.

GENERAL

RASTER NO SOUND NO PICTURE

Check by substitution V1, V2, V3, V4, V5, and V6. Check video detector assembly. Check components associated with the Video IF Strip.

RASTER SNOWY PICTURE WEAK SOUND

Check by substitution V1, V2, V3, V4, V5 and V6.
Check Video IF Components.

TOTAL LOSS OF SYNC

Check by substitution V7, V14 and V15.
Check associated circuit components.

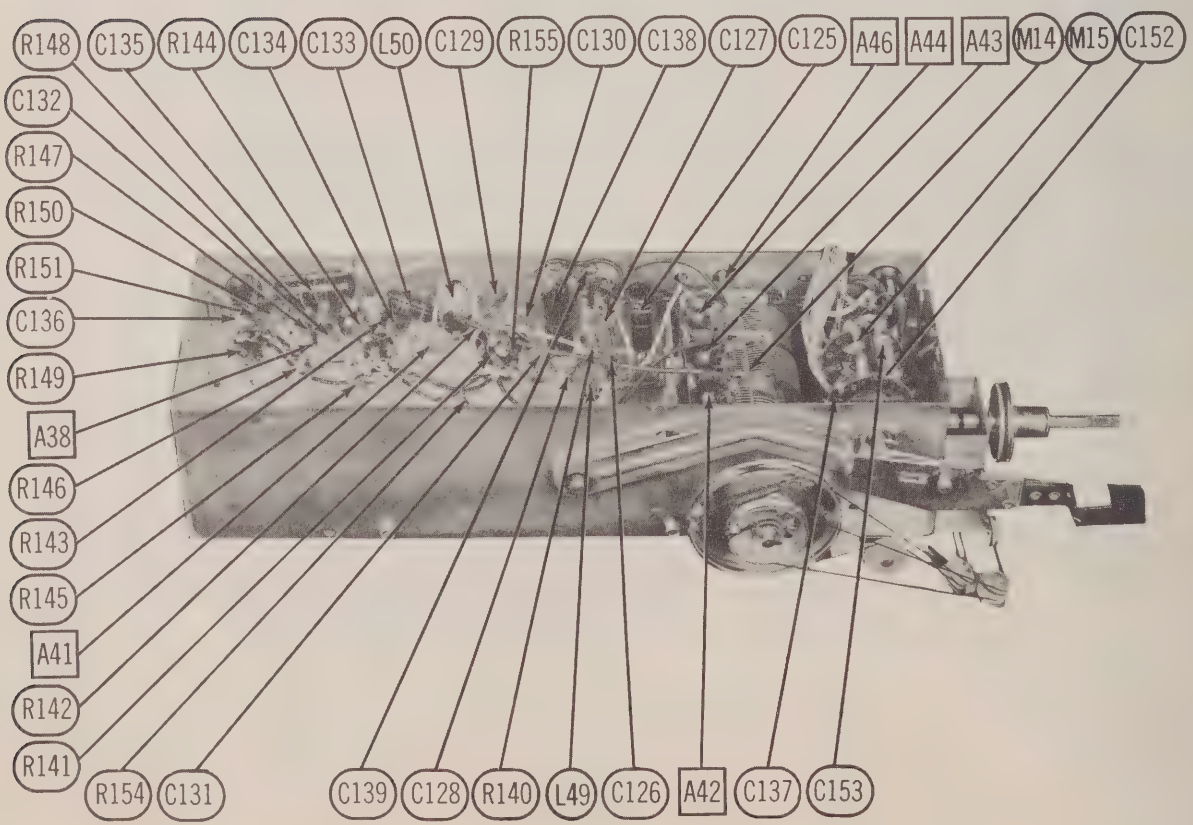
POOR FOCUS

Check adjustment on focalizer unit.
Check potentials applied to picture tube.
If correct, check picture tube.

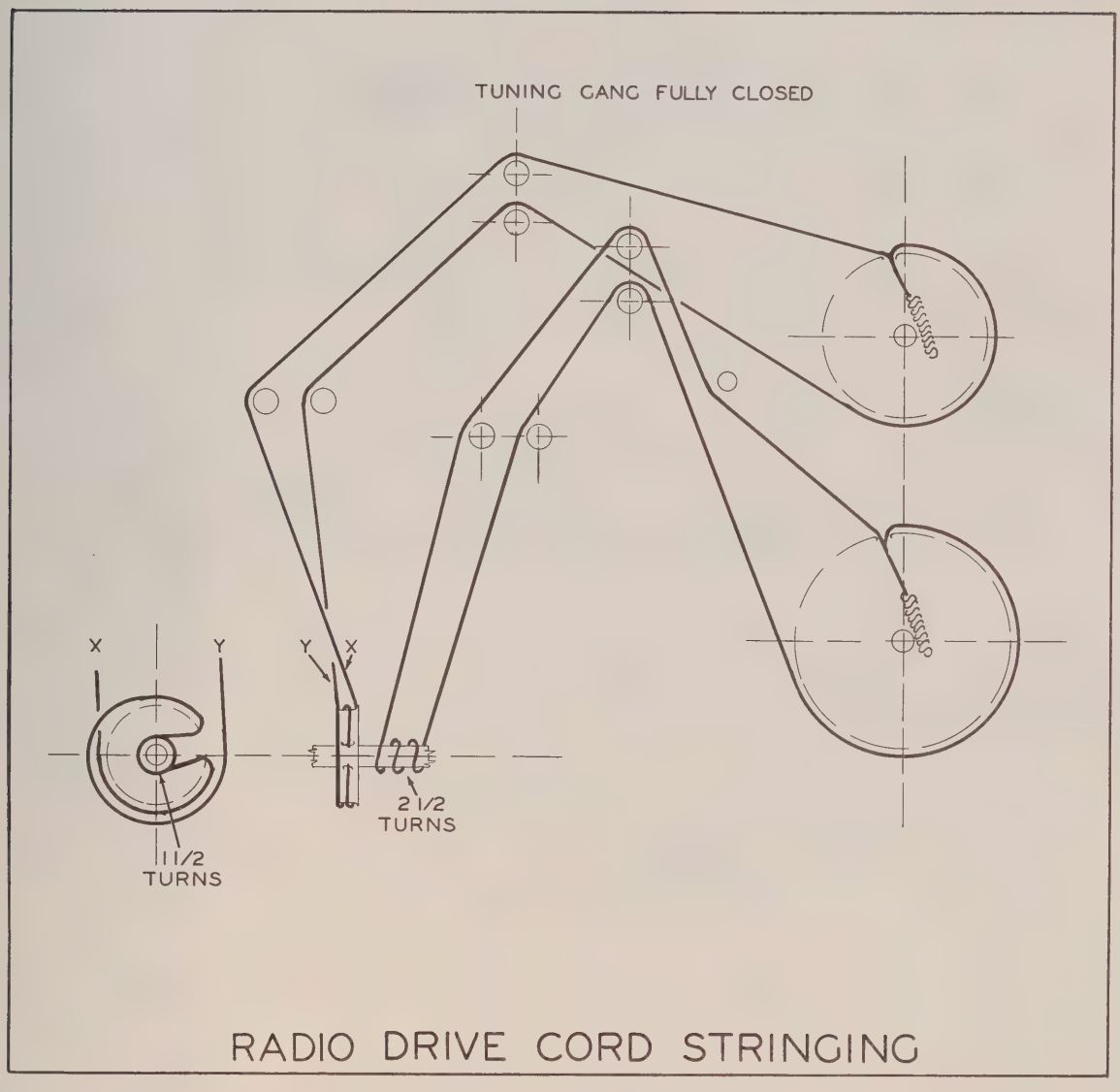
DEAD SET

If tube filaments light, check fuse M3.
If tube filaments fail to light, check AC interlock assembly, switch on volume control and T1.

Symptoms shown above are assumed and are not indicative of the quality and workmanship of this receiving equipment.



RADIO CHASSIS-BOTTOM VIEW



RADIO DRIVE CORD STRINGING

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the RF Tuner Oscillator Circuit may be accomplished by removing the channel selector and fine tuning knobs.

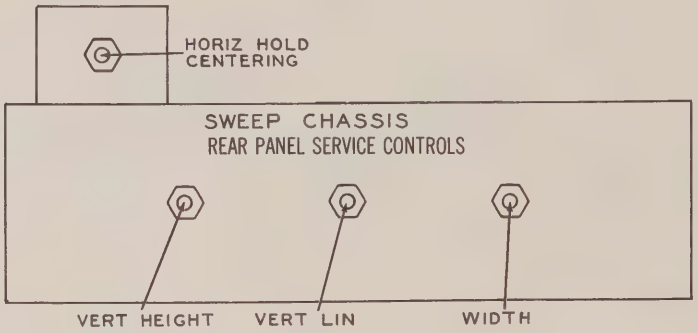
PICTURE TUBE SAFETY GLASS CLEANING

Remove 4 wood screws and wood strip at top of safety glass . Tilt safety glass forward and remove.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator, it is necessary to remove the rear cover and supply power to set. Adjustment is located on top of chassis. Set the horizontal hold control at the center of its range and adjust the horizontal ring coil slug (L42) until picture synchronizes horizontally. (For location see tube placement chart).

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L40) located on top of chassis. (See tube placement chart).

FUSES

One fuse is used for LV power supply protection. (See tube placement chart, for location.)

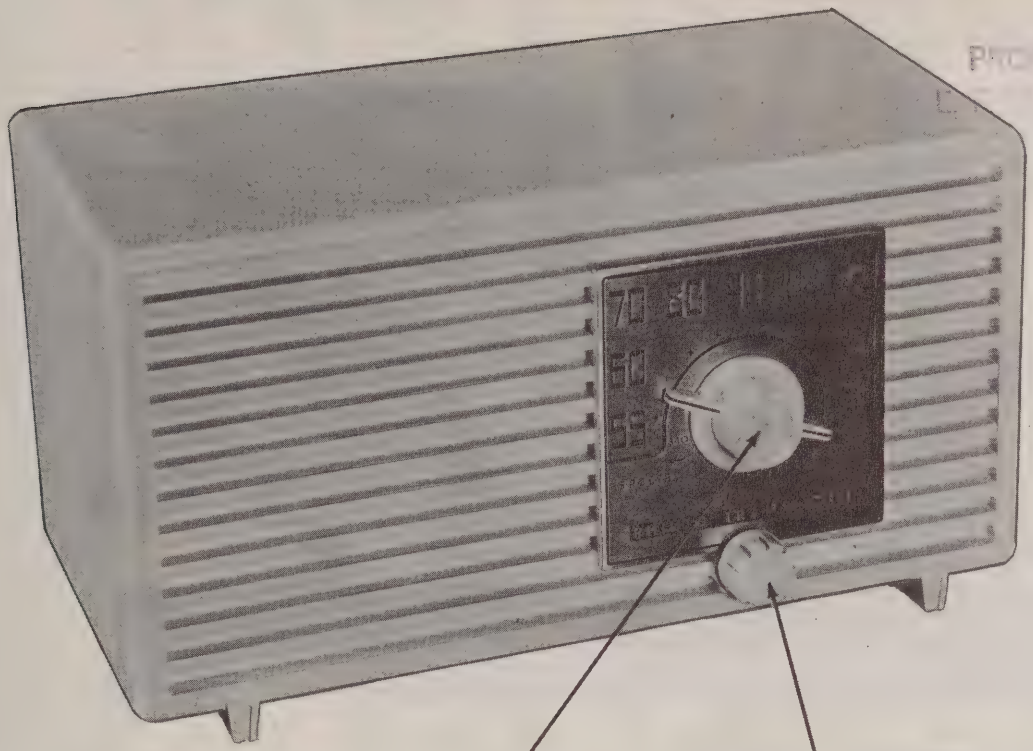
CENTERING

Centering is accomplished mechanically by means of a centering lever on the PM focusing assembly. Adjust the centering lever from side to side, and up and down until the picture is properly centered.

DISASSEMBLY INSTRUCTIONS

TV	RADIO
1. Remove 7 push on type control knobs from front panel.	1. Remove 2 push on type control knobs from front panel.
2. Remove clamp and insulator from fine tuning shaft.	2. Remove 2 wood screws and wood strip above dial face.
3. Disconnect built-in antenna and transmission line from rear cover.	3. Remove 2 wood screws. Remove dial face and station indicator.
4. Remove 16 wood screws. Remove rear cover.	4. Disconnect AM antenna plug, phono motor plug and audio plug.
5. Disconnect speaker plug, volume control plug from radio chassis, volume control plug from TV chassis, radio power plug from deflection chassis, interconnecting cable from deflection chassis, AGC plug, yoke plug, CRT socket and HV lead.	5. Remove 4 chassis bolts. Remove radio chassis.
6. Remove 8 chassis bolt. Remove RF and deflection chassis.	6. Remove 4 speaker nuts. Remove speaker.

PROPERTY OF



PHILCO
MODEL 53-559

PHILCO
MODEL 53-559

TRADE NAME	Philco Model 53-559
MANUFACTURER	Philco Corp., Tioga & "C" Sts., Philadelphia, Pa.
TYPE SET	AC/DC Operated AM Two-Band Superheterodyne Receiver
TUBES (Five)	Types 12BE6 Conv., 12BA6 IF Amp., 12AV6 Det.-AVC-AF Amp., 35C5 Audio Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC/DC
RATING	.25 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540 - 1620 KC
SPECIAL SERVICES	1700-3400KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (grid) of 12BE6 (V1). Low side to B-.	455KC (400~Mod)	BC	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer in not used, reduce dummy antenna to .001 MFD to reduce hum modulation.
2.		Loop	1620KC	"	1620KC	"	A5	To set tuning gang at 1620KC, fully open gang and place a .006 inch non-metallic shim between heel of rotor and the top of stator plates. Close gang to just touch shim and remove shim without disturbing setting. Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1500KC	"	1500KC	"	A6	Adjust for maximum output.
4.		"	3200KC	Special Services	3200KC	"	A7	"

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PARTS LIST AND DESCRIPTIONS

PHILCO
MODEL 53-559

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RTMA BASE TYPE	INSTALLATION NOTES
		PHILCO PART No.	STANDARD REPLACEMENT		
V1	Converter	12BE6	12BE6	7CH	
V2	IF Amplifier	12BA6	12BA6	7BK	
V3	Det-AVC-AF Amp.	12AV6	12AV6	7BT	
V4	Audio Output	35C5	35C5	7CV	
V5	Rectifier	35W4	35W4	5BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1A	30	150	30-2573	PRS150/30-30-30		EDL32V215		3N534	TVA-3444	Orange
B	25	150								Red
C	20	150								Blue
C2	.05	200	30-4650-45	P288-05	DF-503	PJ2S5		PT415	2TM-S5	
C3	944	500	30-1220-65							
C4	47		30-1230-4	SI47NP0	TCZ-47		NP0L-470 N150K-7R5	Z T-545	5TCC-Q47	
C5	7.5		30-1224-83							
C6	.05	200	30-4650-45	P288-05	DF-503	PJ2S5		PT415	2TM-S5	
C7	220	500	60-10225417	1468-00025	D6-221	5W5T25	GP2K-221	MC240	1FM-325	
C8	5000		30-1238-1	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C9A	250		♦30-6001		♦PC-70		♦1406-01		♦104C4	
B										
C	.005									
C10	.022	400	30-4650-43	P488-022	DD-203	PTE4S22		PT4122	4TM-S22	
C11	.047	400	30-4650-45	489ZX-05		PJ4S5		PT4147	4TM-S47	
C12	.2	400	30-4650-49	484-2		PTE4P22		TP429	2TM-P22	

♦ Items C9A, C9B, C9C, R7A, R7B are combined in one unit.
When replacing items separately C9A and C9B should total 250MMF.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	PHILCO PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	500KΩ	½	53-559	Q13-133	AG-60-Z	B-60-S	U-48	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWB	Not Req.	US-26	Attach to R1A

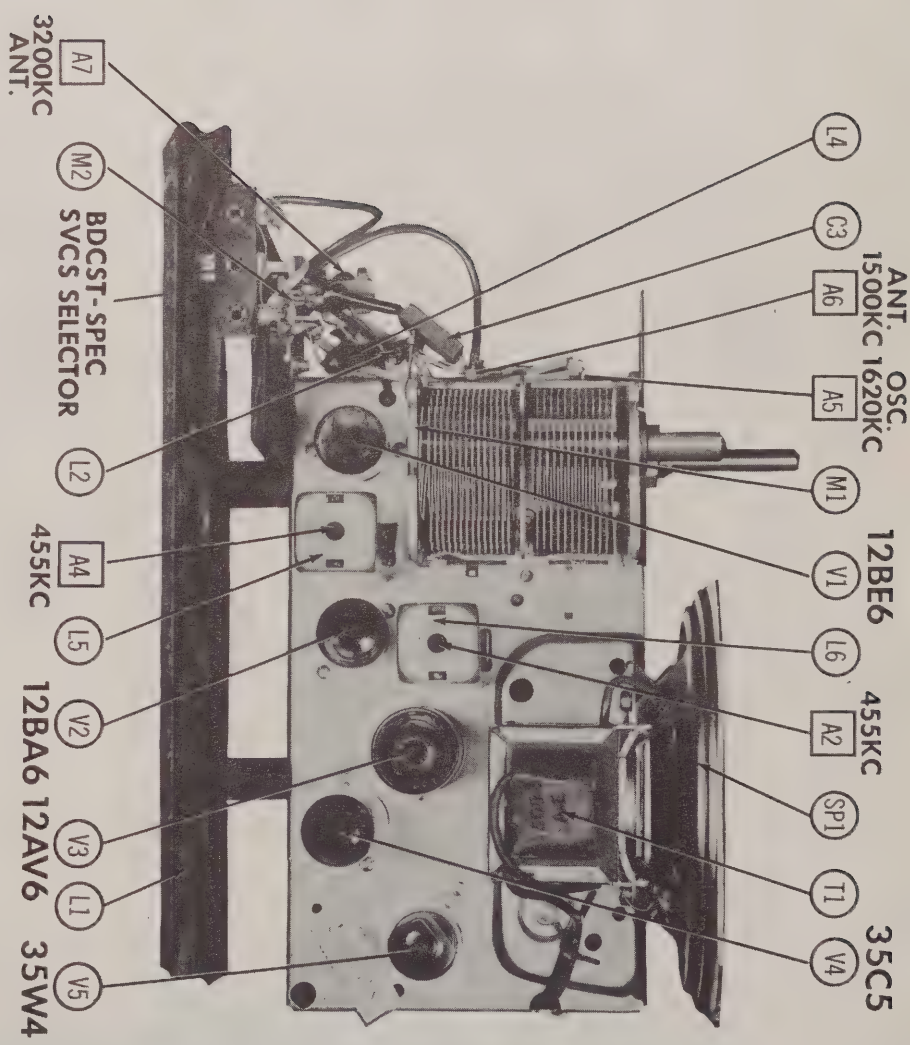
RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PHILCO PART No.	IRC PART No.	
R2	22KΩ	½	66-3228340	BTS-22K	
R3	4700Ω	½	66-2478340	BTS-4700	
R4	2.2Meg	½	66-5228340	BTS-2.2Meg	
R5	47KΩ	½	66-3478340	BTS-47K	
R6	10Meg	½	66-6108340	BTS-10Meg	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PHILCO PART No.	IRC PART No.	
R7A	500KΩ	½	♦30-6001		
B	500KΩ	½			
R8	150Ω	½	66-1158340	BTS-150	
R9	220Ω	1	66-1224340	BTA-220	
R10	1000Ω	½	66-2108340	BTS-1000	
R11	*	*	33-1343-3		

* Special resistor-measures 880Ω cold, 100Ω hot.
♦ Items R7A, R7B, C9A, C9B, C9C are combined in one unit.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA					NOTES
	IMPEDANCE		DC RES.		PHILCO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	
	PRI.	SEC.	PRI.	SEC.						
T1	2KΩ	3.4Ω	234Ω	.92Ω	Part of speaker.	A-3332 ①	A-3025 ①	RO-2 ①	S-2X ①	①Bend mtg. tabs down, file out slots, mount on original mtg. bracket.

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	PHILCO PART No.	JENSEN PART No.	QUAM PART No.	
SP1	4"	PM	3.4Ω	36-1627-23	ST-113 Mod. P4-X	4A07	

COILS (RF-IF)

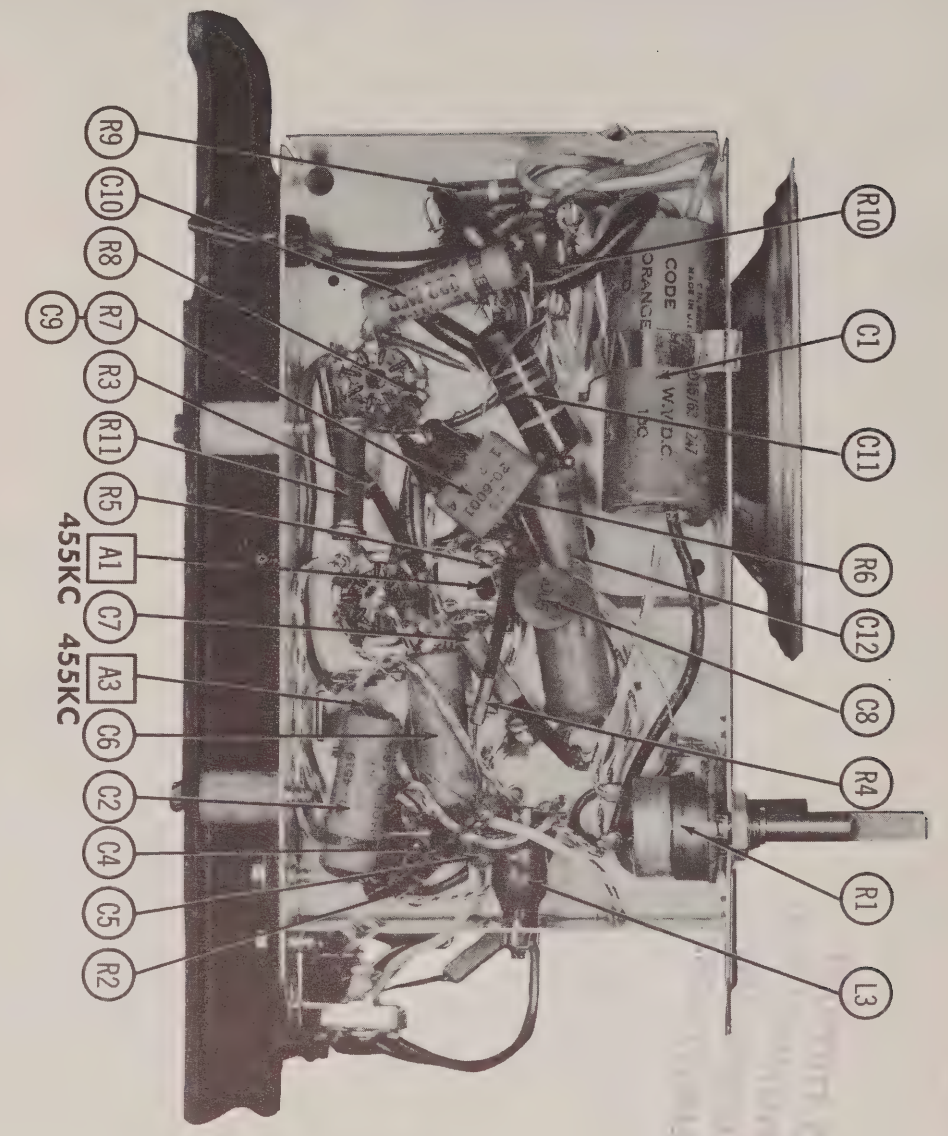
ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop Ant.	3.1Ω		76-7705-1				Includes cabinet back
L2	SS Ant. Coil	1.2Ω		32-4561-3				
L3	BC Osc. Coil	1Ω	6.5Ω	32-4453-6			70-Osc.*	
L4	SS Osc. Coil	3.2Ω		32-4562-2				
L5	Input IF	14.5Ω	14.5Ω	32-4161A	16-6758	BC-352	12-C1	
L6	Output IF	15Ω	15Ω	32-4240A	16-6770	BC-355	12-C6	

* Disregard top on secondary winding.

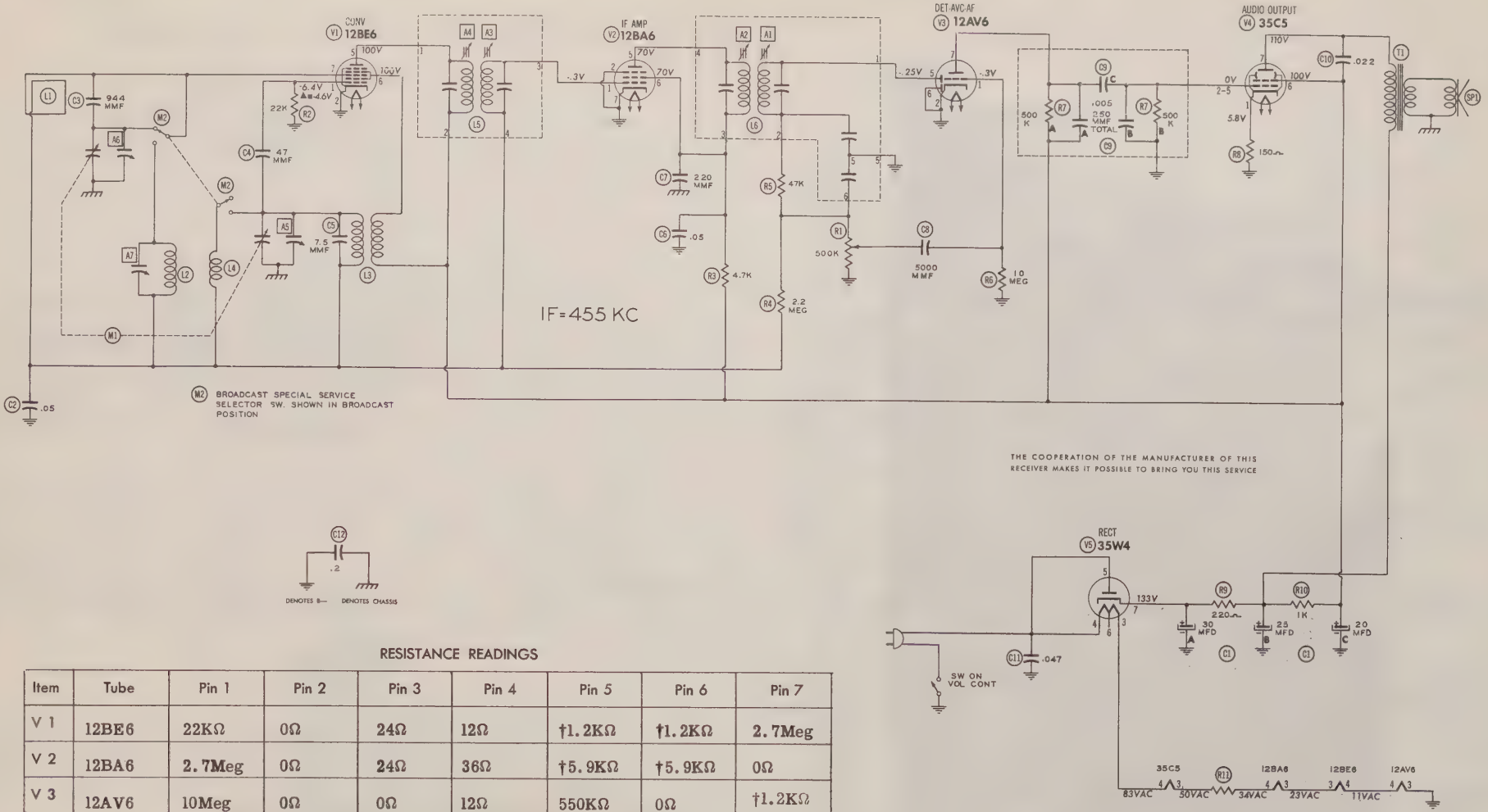
MISCELLANEOUS

ITEM No.	PART NAME	PHILCO PART No.	NOTES
M1	Tuning Capacitor	31-2751-13	32-495MMF, 20-170MMF
M2	Switch	42-1796-2	Broadcast-Special Services
A7	Trimmer Capacitor	31-6473-29	Antenna (Special Services)
	Cabinet	10921-5	Driftwood
	Cabinet	10921-6	Mahogany
	Scale (Dial)	28-9292	
	Knob	54-4978-2	Tuning
	Knob	54-4118	Off-On Volume

CHASSIS—BOTTOM VIEW



PHILCO MODEL 53-559



RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	0Ω	24Ω	12Ω	†1.2KΩ	†1.2KΩ	2.7Meg
V 2	12BA6	2.7Meg	0Ω	24Ω	36Ω	†5.9KΩ	†5.9KΩ	0Ω
V 3	12AV6	10Meg	0Ω	0Ω	12Ω	550KΩ	0Ω	†1.2KΩ
V 4	35C5	150Ω	500K	910Ω	945Ω	500KΩ	†1.2KΩ	†455Ω
V 5	35W4	†220Ω	†220Ω	945Ω	980Ω	980Ω	975Ω	300KΩ

ALL MEASUREMENTS TAKEN IN "BROADCAST" POSITION UNLESS OTHER WISE SPECIFIED.
▲ TAKEN WITH VACUUM TUBE VOLTMETER.
■ MEASURED IN "SPECIAL SERVICES" POSITION .
† MEASURED FROM PIN 7 OF V5.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

PROPERTY OF

ROLAND
MODEL 4T1

ROLAND
MODEL 4T1

TRADE NAME	Roland Model 4T1
MANUFACTURER	Roland Radio Corp., 12-30 Anderson Ave., Mt. Vernon, N.Y.
TYPE SET	AC/DC Operated AM Superheterodyne Receiver
TUBES (Four)	Types 12BE6 Conv., 12AT6 Det.-AVC-AF Amp., 50C5 Audio Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC-DC RATING .24 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (grid) of 12BE6 (V1). Low side to B-.	455KC (400~Mod)	Tuning gang fully open	Across voice coil	A1, A2	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.	"	"	1620KC	"	"	A3	"
3.	50MMF	High side to antenna terminal of L1 (disconnect hank). Low side to B-.	1400KC	Tune to 1400KC signal	"	A4	Adjust for maximum output.
4.	"	"	600KC	Tune to 600KC signal	"		Check tracking at 600KC. If necessary slightly bend outer rotor plates of antenna capacitor for optimum tracking, then repeat step 3.

Replace receiver in cabinet, turn tuning capacitor fully open and set pointer at the "6" in "160"

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PARTS LIST AND DESCRIPTIONS

ROLAND
MODEL 4T1

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RTMA BASE TYPE	INSTALLATION NOTES
		ROLAND PART No.	STANDARD REPLACEMENT		
V1	Converter	12BE6	12BE6	7CH	
V2	Det-AVC-AF Amp.	12AT6	12AT6	7BT	
V3	Audio Output	50C5	50C5	7CV	
V4	Rectifier	35W4	35W4	5BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	ROLAND PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1A	50	150		PRS150/50-30		EDL5315		2N520	TVA-2450	Red Green
B	30	150								
C2	.05	200		P288-05	DF-503	PJ2S5		PT415	2TM-S5	
C3	215	500		SI220	D6-221	5W5T25	GP2K-221	UC-5322	5GA-T22	
C4	.005	600		P688-005	D6-502	PTE6D5	GP2-333-502	PT625	6TM-D5	
C5	.005	600		P688-005	D6-502	PTE6D5	GP2-333-502	PT625	6TM-D5	
C6	.02	600		P688-02	DD-203	PTE6S2		PT612	6TM-S2	
C7	.05	400		P488-05		PTE4S5		PT415	4TM-S5	
C8	.05	400		P488-05		PTE4S5		PT415	4TM-S5	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	ROLAND PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	1 Meg	½	VC-42	Q13-137	AG-83-Z	BSK-70-S	U-53	Volume
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWB	Not Req.	US-26	Attach to R1A

RESISTORS

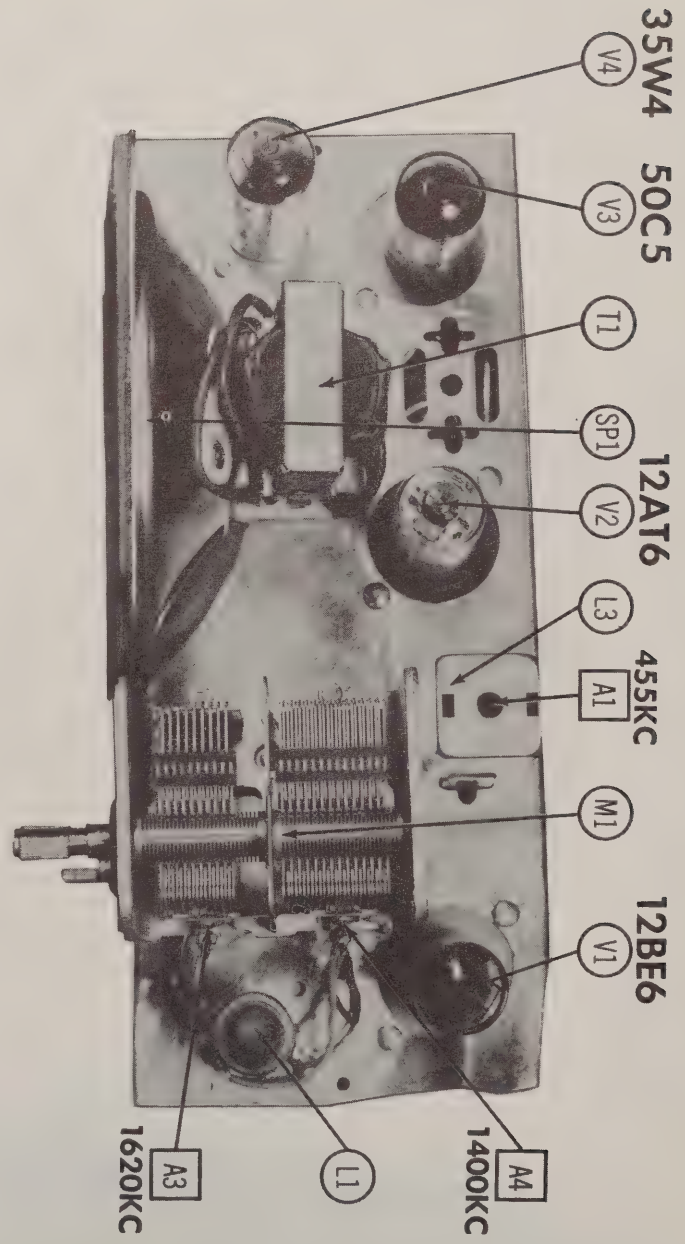
ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	ROLAND PART No.	IRC PART No.	
R2	4.7Meg	½		BTS-4.7Meg	
R3	22KΩ	½		BTS-22K	
R4	10Meg	½		BTS-10Meg	
R5	220KΩ	½		BTS-220K	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	ROLAND PART No.	IRC PART No.	
R6	330KΩ	½		BTS-330K	
R7	18Ω	½			
R8	1500Ω	1		BTA-1500	
R9	47Ω	1			

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA					NOTES
	IMPEDANCE		DC RES.		ROLAND PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	
	PRI.	SEC.	PRI.	SEC.						
T1	2.16KΩ	3.3Ω	168Ω	.44Ω	P-70-D	A-3332 ①	A-3025 ①	RO-2 ①	S-2X ①	①Bend mounting tabs down, file out slots, mount on original mounting bracket.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	ROLAND PART No.	JENSEN PART No.	QUAM PART No.	
SP1	4"	PM	3.1Ω	SP-40	ST-113 Mod. P4-X	4A07	

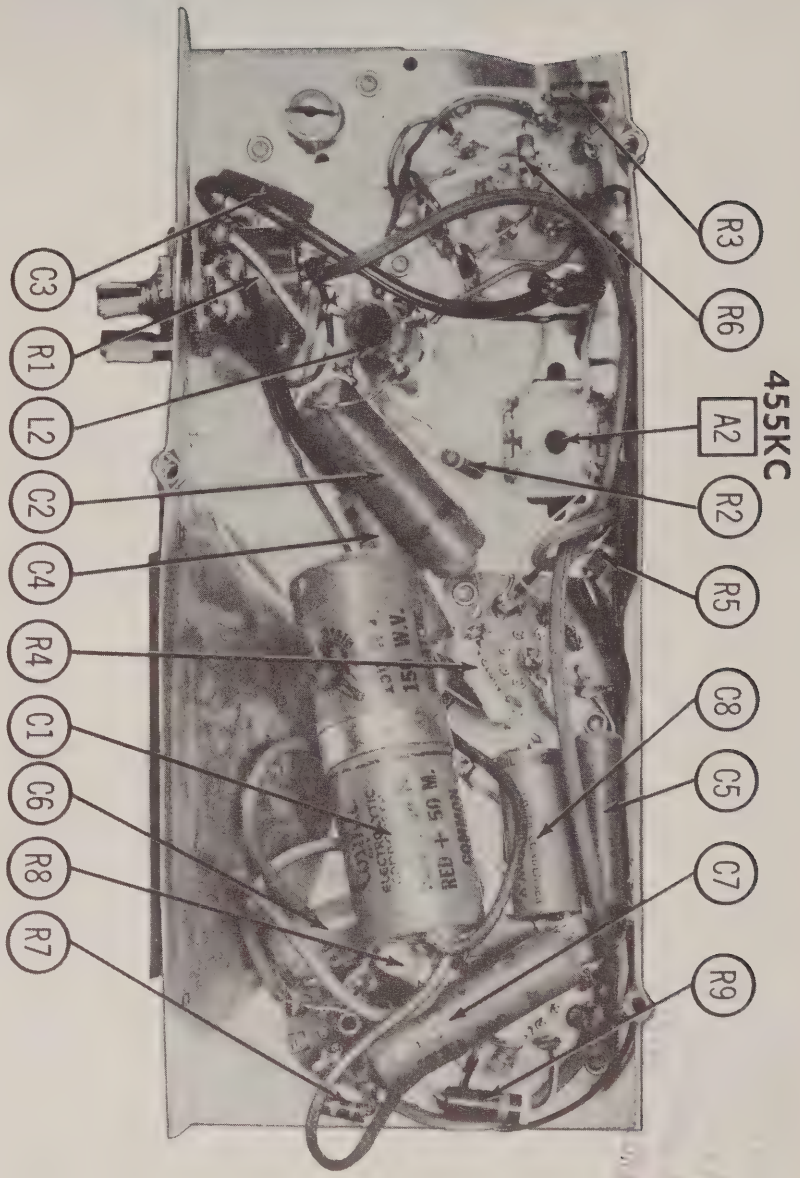
COILS (RF-IF)

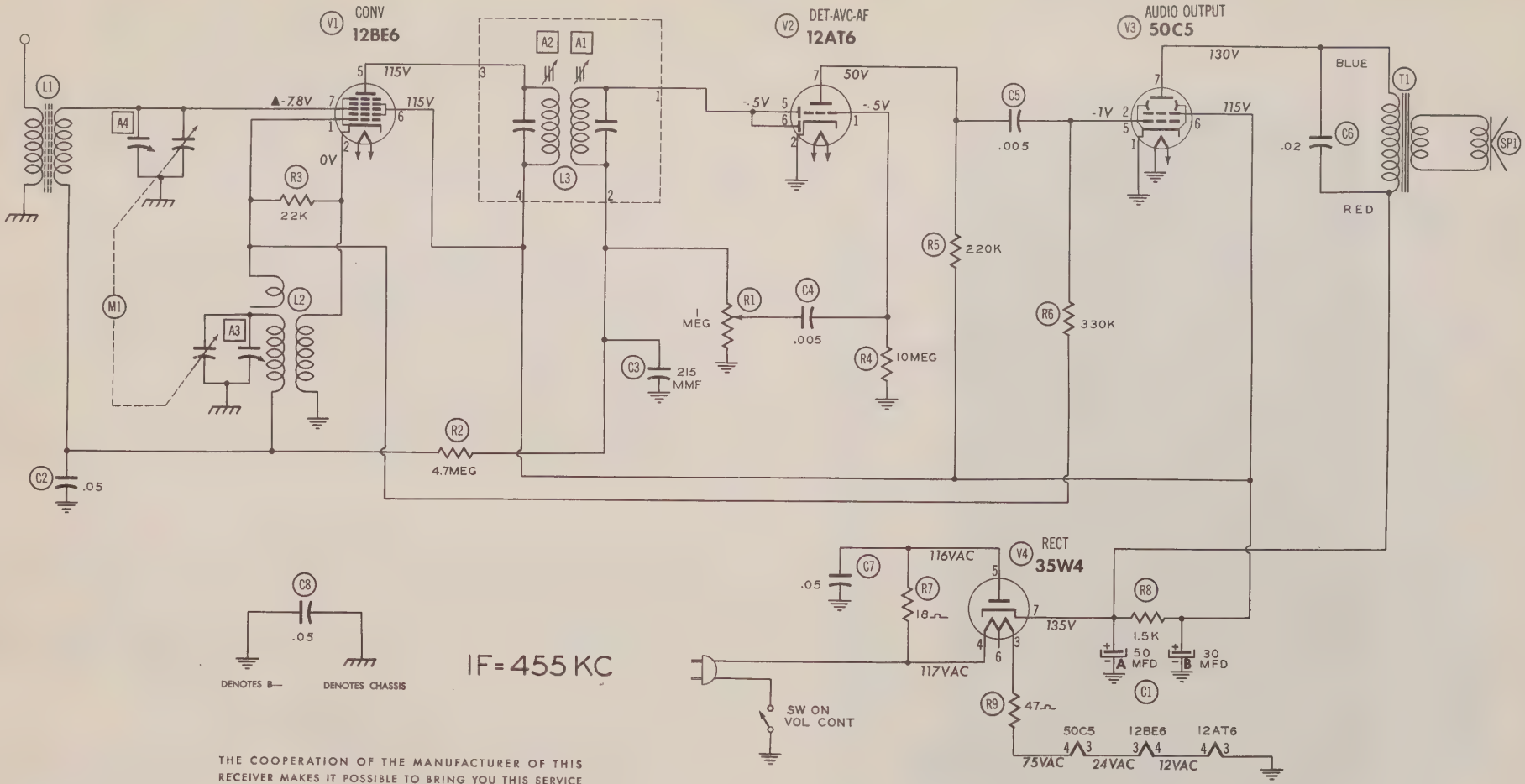
ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	ROLAND PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil	75Ω	2.5Ω		14-1026	BC-380	72-A	
L2	Osc. Coil	.5Ω	5.5Ω		14-1073			
L3	IF Trans.	24Ω	25Ω	LF-50	16-6758	BC-353	12-C2	

MISCELLANEOUS

ITEM No.	PART NAME	ROLAND PART No.	NOTES
M1	Tuning Capacitor	CV-21	33-456MMF, 27-190MMF

CHASSIS—BOTTOM VIEW





THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	.5Ω	24Ω	12Ω	†1.5KΩ	†1.5KΩ	5.7Meg
V 2	12AT6	10Meg	0Ω	0Ω	12Ω	1 Meg	1 Meg	†220KΩ
V 3	50C5	0Ω	350KΩ	24Ω	85Ω	350KΩ	†1.5KΩ	†168Ω
V 4	35W4	†0Ω	INF	132Ω	165Ω	183Ω	160Ω	100KΩ

▲ TAKEN WITH VACUUM TUBE VOLTMETER
† MEASURED FROM PIN 7 OF V4.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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213-7

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

STUDEBAKER
MODEL AC-2301 (S-5323)

STUDEBAKER
MODEL AC-2301 (S-5323)

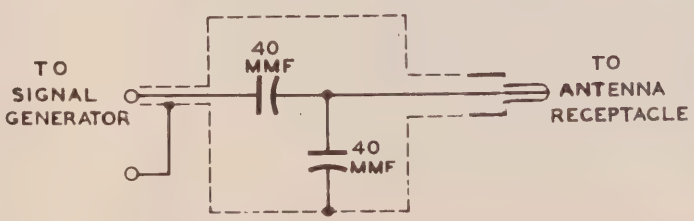
STUDEBAKER
MODEL AC-2301 (S-5323)

TRADE NAME	Studebaker Model AC-2301 (Philco Model S-5323) (For 1953 Studebaker Automobiles)
MANUFACTURER	Philco Corp., Tioga & "C" Sts., Philadelphia, Pa.
TYPE SET	Battery Operated Custom Built AM Automobile Superheterodyne Receiver
TUBES (Six)	Types 6BA6 RF Amp., 6BE6 Conv., 6BA6 IF Amp., 6AV6 Det.-AVC-AF Amp., 6AQ5 Audio Output, 6X4 Rectifier
POWER SUPPLY	6 Volt Storage Battery — RATING 6.4 Amp. @ 6.3 Volts DC
TUNING RANGE—BROADCAST	535-1605 KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Set tone control to "Hi" position.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05MFD	High side to pin 7 (grid) of 6BE6 (V2). Low side to chassis.	455KC (400~ Mod)	High frequency end stop	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	Fig. 1	Thru dummy to antenna receptacle.	1605KC	"	"	A5	"
3.	"	"	1400KC	Tune to 1400KC signal	"	A6, A7	"



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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RTMA BASE TYPE	INSTALLATION NOTES
		PHILCO PART No.	STANDARD REPLACEMENT		
V1	RF Amplifier	6BA6	6BA6	7BK	
V2	Converter	6BE6	6BE6	7CH	
V3	IF Amplifier	6BA6	6BA6	6BK	
V4	Det-AVC-AF Amp.	6AV6	6AV6	7BT	
V5	Audio Output	6AQ5	6AQ5	7BZ	
V6	Rectifier	6X4	6X4	5BS	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1A	■30	350	61-0086-7	AFH2-42		BO41		FP376.1	TVL-2663	
B	▲10	350								
C2	10	500	60-00105417	1469-00001		5R5Q1		MCB215	MS-41	
C3	.047	200	30-4650-45	P288-047	DF-503	PJ2S5		PT4147	2TM-S47	
C4	10	500	60-00105417	1469-00001		5R5Q1		MCB215	MS-41	
C5	60		30-1224-110							
C6	65		30-1224-87				N750K-650			
C7	.047	200	30-4650-45	P288-047	DF-503	PJ2S5		PT4147	2TM-S47	
C8	.0047	400	30-4650-56	P688-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	
C9	100		62-110001021	SI100	D6-101	TM5T1	GP1K-101	UC-531	5GA-T1	
C10	.01	400	30-4650-41	P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C11	.01	400	30-4650-41	P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C12	.01	400	30-4650-41	P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C13	.01	400	30-4650-41	P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C14	.0068	1600	30-4661-8	VBC-23		PTE16D68		PT1627	MB-D68	
C15	330		62-133001001	SI330	D6-331		GP2K-331	UC-5333	5GA-T33	
C16	.5	120	61-0183	VHC36		PJ2P5		VO480	68P20	
C17	330		62-133001001	SI330	D6-331		GP2K-331	UC-5333	5GA-T33	
C18	.5	120	61-0183	VHC36		PJ2P5		VO480	68P20	

CONTROLS

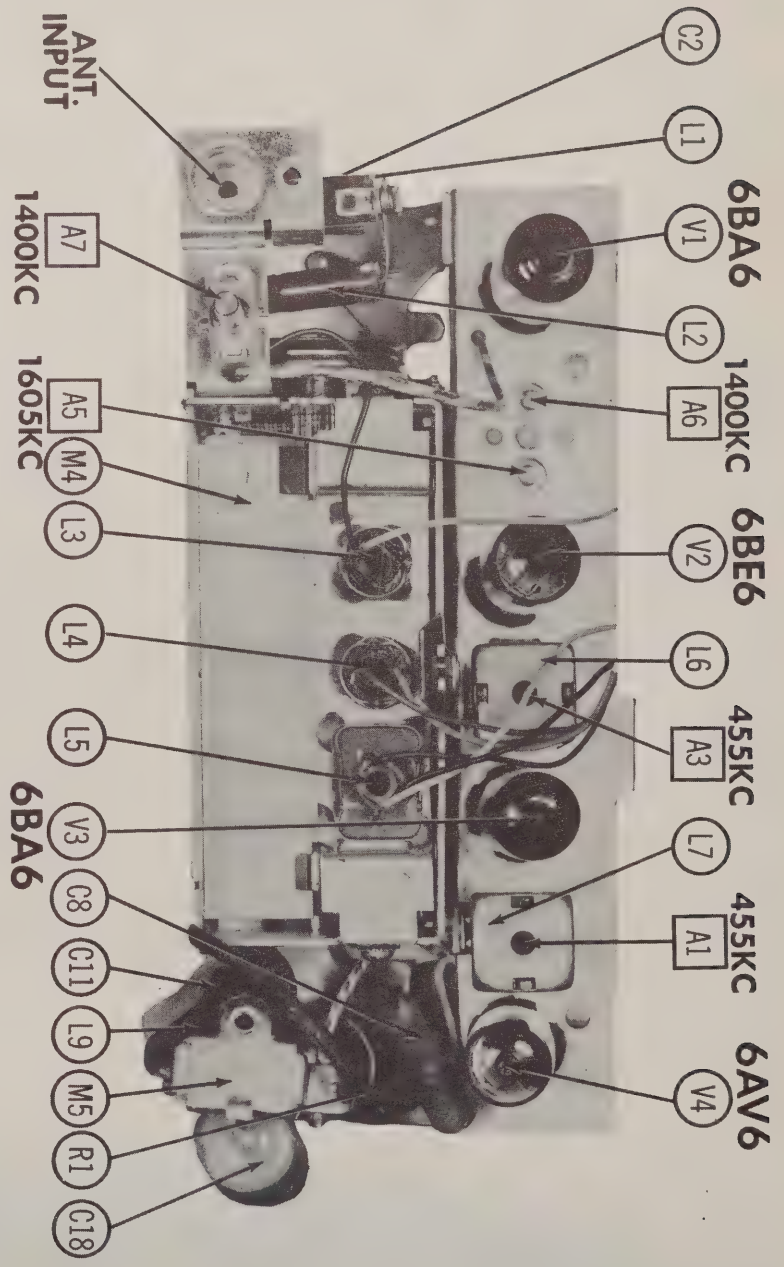
ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	PHILCO PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1 A	Switch		33-5570					Tone Switch
B	350KΩ	½						Volume & Switch

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PHILCO PART No.	IRC PART No.	
R2	330Ω	½	66-1338340	BTS-330	
R3	68KΩ	½	66-3688340	BTS-68K	
R4	22KΩ	½	66-3228340	BTS-22K	
R5	10KΩ	½	66-3108340	BTS-10K	
R6	27KΩ	1	66-3274340	BTA-27K	
R7	330Ω	½	66-1338340	BTS-330	
R8	1 Meg	½	66-5108340	BTS-1 Meg	
R9	22KΩ	½	66-3228340	BTS-22K	
R10	22KΩ	½	66-3228340	BTS-22K	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PHILCO PART No.	IRC PART No.	
R11	15 Meg	½	66-6158340	BTS-15 Meg	
R12	220KΩ	½	66-4228340	BTS-220K	
R13	470KΩ	½	66-4478340	BTS-470K	
R14	22KΩ	½	66-3228340	BTS-22K	
R15	22KΩ	½	66-3228340	BTS-22K	
R16	220Ω	1	66-1224340	BTA-220	
R17	2200Ω	1	66-2224340	BTA-2200	
R18	100Ω	1	66-1104340	BTA-100	
R19	100Ω	1	66-1104340	BTA-100	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (VIBRATOR)

ITEM No.	RATING				REPLACEMENT DATA				
	PRI.	SEC. 1	SEC. 2	SEC. 3	PHILCO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.
T1	6.3VCT @3.8A	510VCT .052ADC			32-8313-3 32-8313-1 ①		P-3068 ②		

① Alternate power trans.
② Drill new mtg. holes.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA					NOTES
	IMPEDANCE		DC RES.		PHILCO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	
	PRI.	SEC.	PRI.	SEC.						
T2	5.1KΩ	3.4Ω	334Ω	.25Ω	32-8315-1	A-2930	A-3877	RO-8	S-3X	

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	PHILCO PART No.	JENSEN PART No.	QUAM PART No.	
SP1	6½"	PM	3.4Ω	36-1638-10	ST-806 Mod. P7-U	7A21	

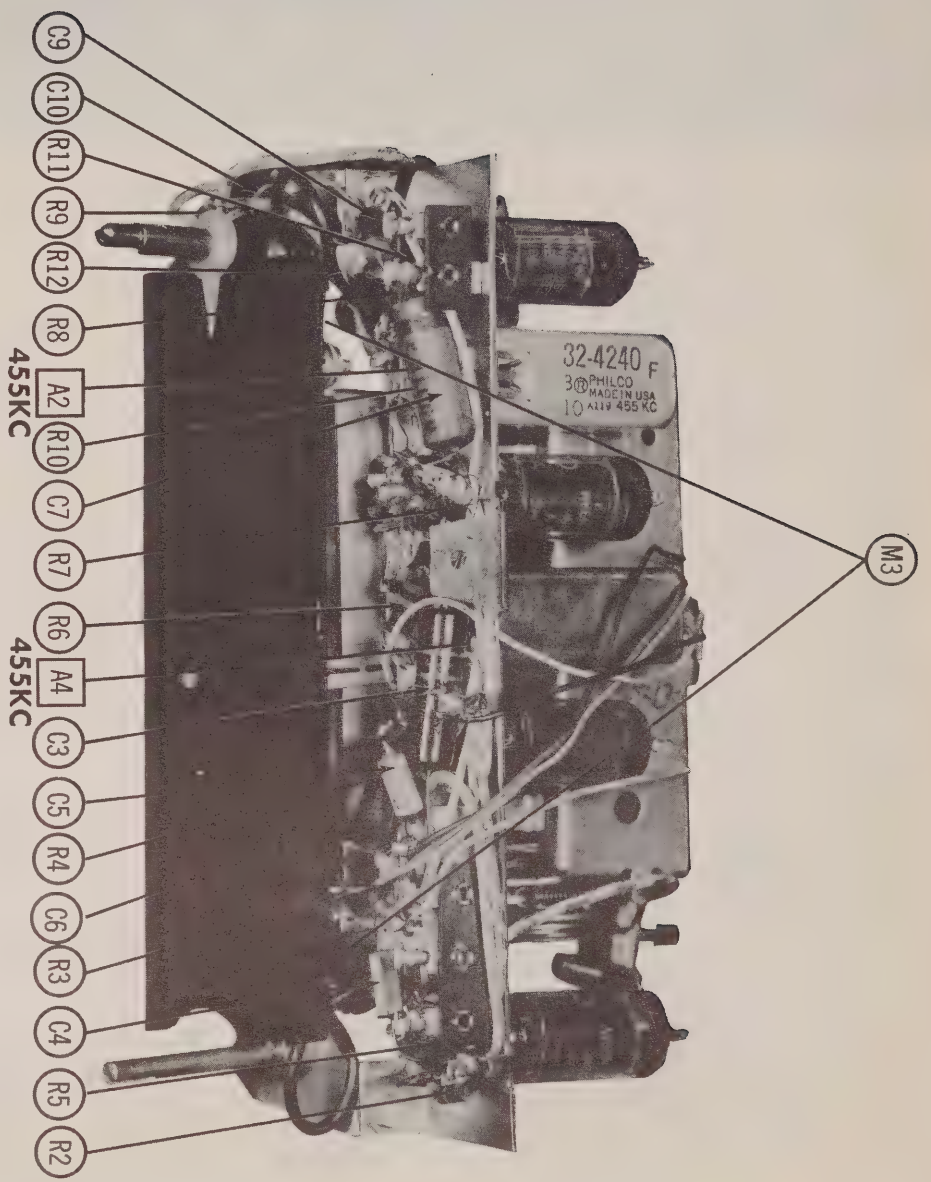
COILS (RF-IF)

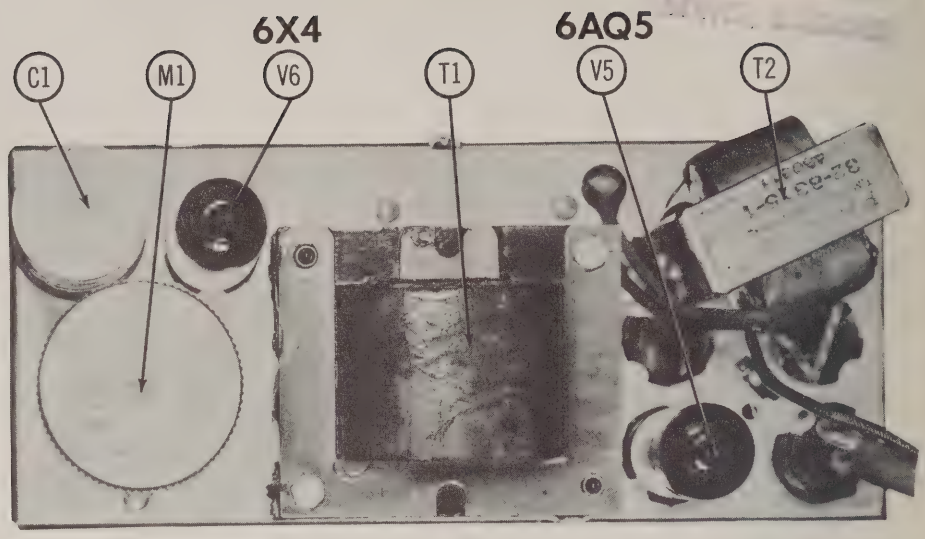
ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Loading Coil	4Ω		32-4422-24			4610	5.6 Microhenries, (IRC part #CL-1)
L2	RF Coupling	.7Ω		65-0378			4612	11 Microhenries
L3	Ant. Coil	13Ω		32-4586				Less tuning core, core part #28-9336
L4	RF Coil	13Ω		32-4585				Less tuning core, core part #28-9336
L5	Osc. Coil	3Ω(tap @.8Ω)		32-4587				Less tuning core, core part #28-9336
L6	Input IF	11.5Ω	11.5Ω	32-4160A	16-6758	BC-352	12-C1	
L7	Output IF	14Ω	14Ω	32-4240A	16-6770	BC-355	12-C6	
L8	Vibrator Hash Choke	.1Ω		32-4170-4				.2 Microhenry
L9	Fil. Choke	0Ω		32-1644				

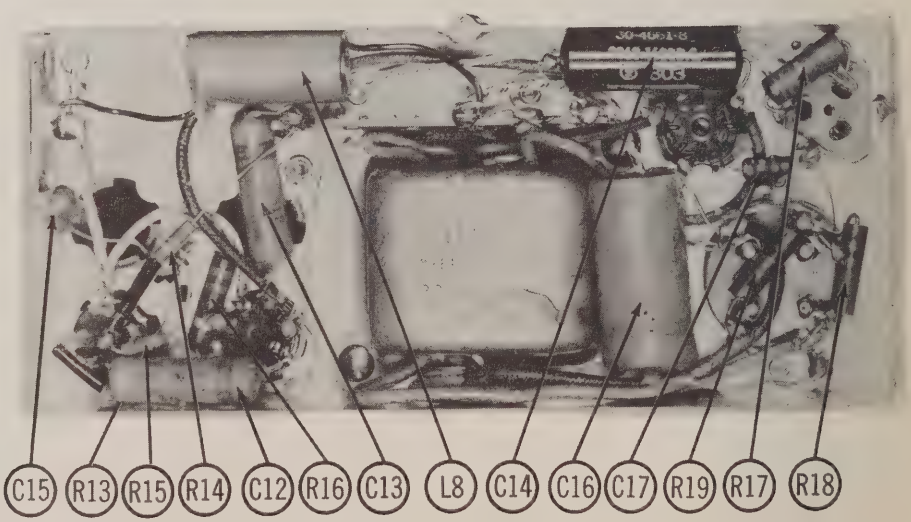
VIBRATOR

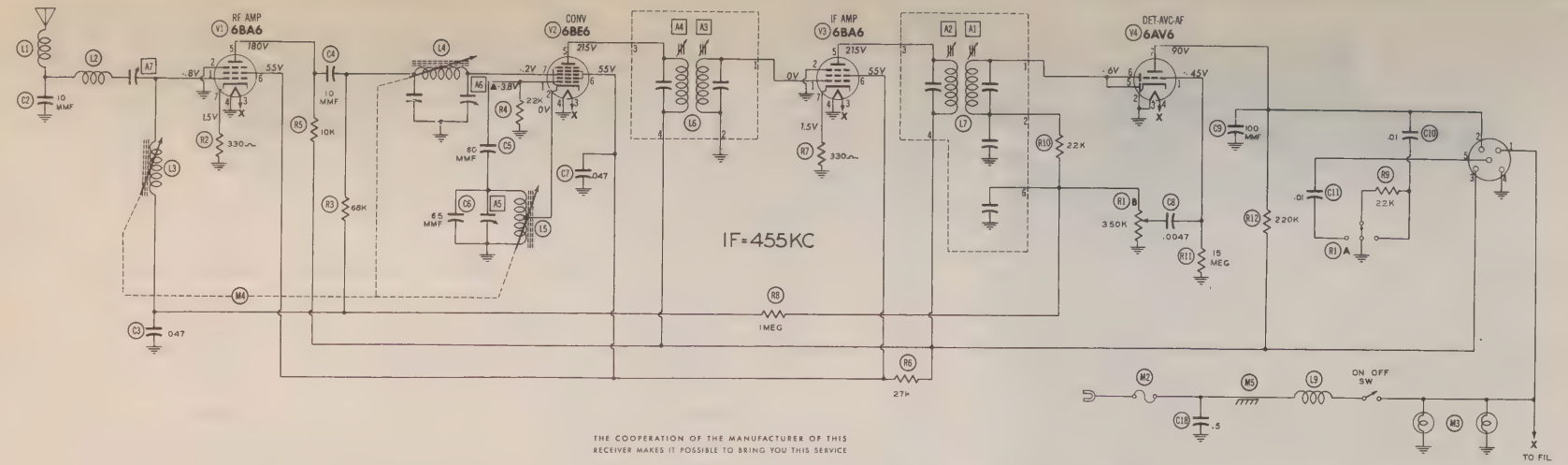
ITEM No.	TYPE	INPUT VOLTS	FREQUENCY	REPLACEMENT DATA				NOTES
				PHILCO PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	RADIART PART No.	
M1	Int.	6.3V	115∿	83-0035	5326	859	5326	

CHASSIS—BOTTOM VIEW

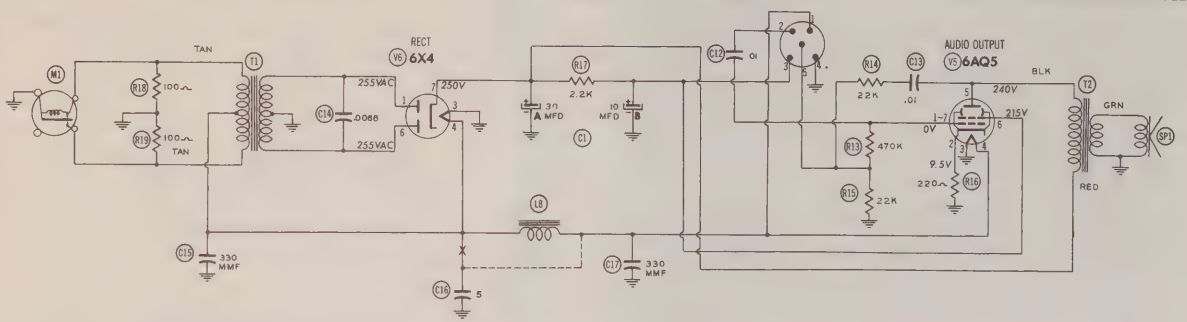



6X4
6AQ5
C1
M1
V6
T1
V5
T2


C15
R13
R15
R14
C12
R16
C13
L8
C14
C16
C17
R19
R17
R18



THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE



RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	6BA6	1.3Meg	0Ω	.1Ω	0Ω	†12KΩ	†29KΩ	330Ω
V 2	6BE6	22KΩ	.8Ω	.1Ω	0Ω	†2.2KΩ	†29KΩ	1.4Meg
V 3	6BA6	11.5Ω	0Ω	.1Ω	0Ω	†2.2KΩ	†29KΩ	330Ω
V 4	6AV6	15Meg	0Ω	0Ω	.1Ω	370KΩ	370KΩ	†220KΩ
V 5	6AQ5	490KΩ	220Ω	0Ω	.1Ω	†334Ω	†2.2KΩ	490KΩ
V 6	6X4	436Ω	INF	0Ω	.1Ω	INF	394Ω	1 Meg

▲ TAKEN WITH VACUUM TUBE VOLTMETER.
† MEASURED FROM PIN 7 OF V6.

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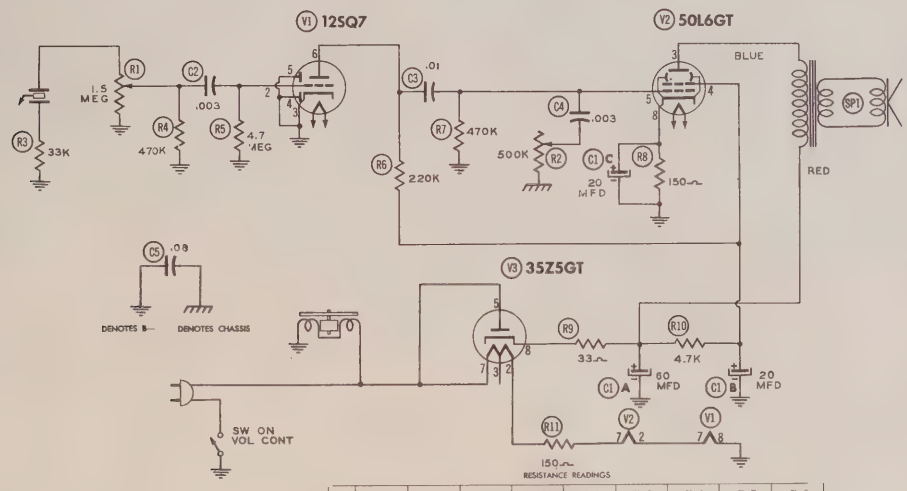
1-DC Voltage measurements are at 20,000 ohms per volt:AC Voltages measured at 1000 ohms per volt.
2-Socket connections are shown as bottom views.
3-Measured values are from socket pin to common negative.
4-Battery voltage maintained at 6.3Volts for voltage readings.
5-Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6-Volume control at maximum, no signal applied for voltage measurements.

PROPERTY OF

VM
MODEL 150A

VM
MODEL 150A

TRADE NAME	V-M Model 150A
MANUFACTURER	V-M Corp., Benton Harbor, Mich.
TYPE SET	AC Operated Phonograph Audio Amplifier With 3 Speed Manual Record Player
TUBES (Three)	Types 12SQ7 AF Amp., 50L6GT Audio Output, 35Z5GT Rectifier
POWER SUPPLY	110-120 Volts AC - 60 Cycles RATING .22 Amp. @ 117 Volts AC



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RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	12SQ7	INF	4.7Meg	0Ω	0Ω	0Ω	†225KΩ	12Ω	.0Ω
V 2	50L6GT	INF	12Ω	†157Ω	†4.7KΩ	470KΩ	INF	54Ω	150Ω
V 3	35Z5GT	INF	52Ω	44Ω	†33Ω	24Ω	24Ω	24Ω	1 Meg

† MEASURED FROM PIN 8 OF V3.
NOTE: FILAMENT RESISTANCE MEASUREMENTS INCLUDE PARALLEL EFFECT OF PHONO MOTOR.

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA V-M PART No.	REPLACEMENT DATA STANDARD REPLACEMENT	RTMA BASE TYPE	INSTALLATION NOTES
V1	Phono Pre. Amp.	12SQ7	12SQ7	8Q	
V2	Audio Output	50L6GT	50L6GT	7S	
V3	Rectifier	35Z5GT	35Z5GT	6AD	

CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA V-M PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C1A	60	150		PRS150/50-30-20		EDL33215C		2N520 TC36	TVA-3430	Red Green Yellow
B	20	150								
C	20	50								
C2	.003	400		P688-003	D6-302	PTE6D3	GP2-333-302	PT623	6TM-D3	
C3	.01	400		P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C4	.003	400		P488-003	D6-302	PTE6D3	GP2-333-302	PT623	6TM-D3	
C5	.08	400								

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA V-M PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500KΩ	½	11944	AQ13-133	AG-60-Z	BSK-60	U-48	Tone
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R1A
R2A	1.5Meg	½	11941	Q13-137	AG-66-Z	AB-76	U-55	Volume
B	Shaft		Not Req.	Not Req.	KSS-3	AK-4	Not Req.	Attach to R2A
C	Switch		Not Req.	76-1	SWB	KB-1	US-26	Attach to R2A

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA V-M PART No.	IRC PART No.	NOTES
R3	33KΩ	½		BTS-33K	
R4	470KΩ	½		BTS-470K	
R5	4.7Meg	½		BTS-4.7Meg	
R6	220KΩ	½		BTS-220K	
R7	470KΩ	½		BTS-470K	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA V-M PART No.	IRC PART No.	NOTES
R8	150Ω	½		BTS-150	
R9	33Ω	½			
R10	4700Ω	½		BTS-4700	
R11	150Ω	5		1 3/4A-150	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING IMPEDANCE PRI.	RATING IMPEDANCE SEC.	RATING DC RES. PRI.	RATING DC RES. SEC.	REPLACEMENT DATA V-M PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	NOTES
T1	2.1KΩ	3.5Ω	124Ω	.38Ω		A-3332	A-3025	RO-2 ①	S-2X ①	① Drill one new mounting hole.

SPEAKER

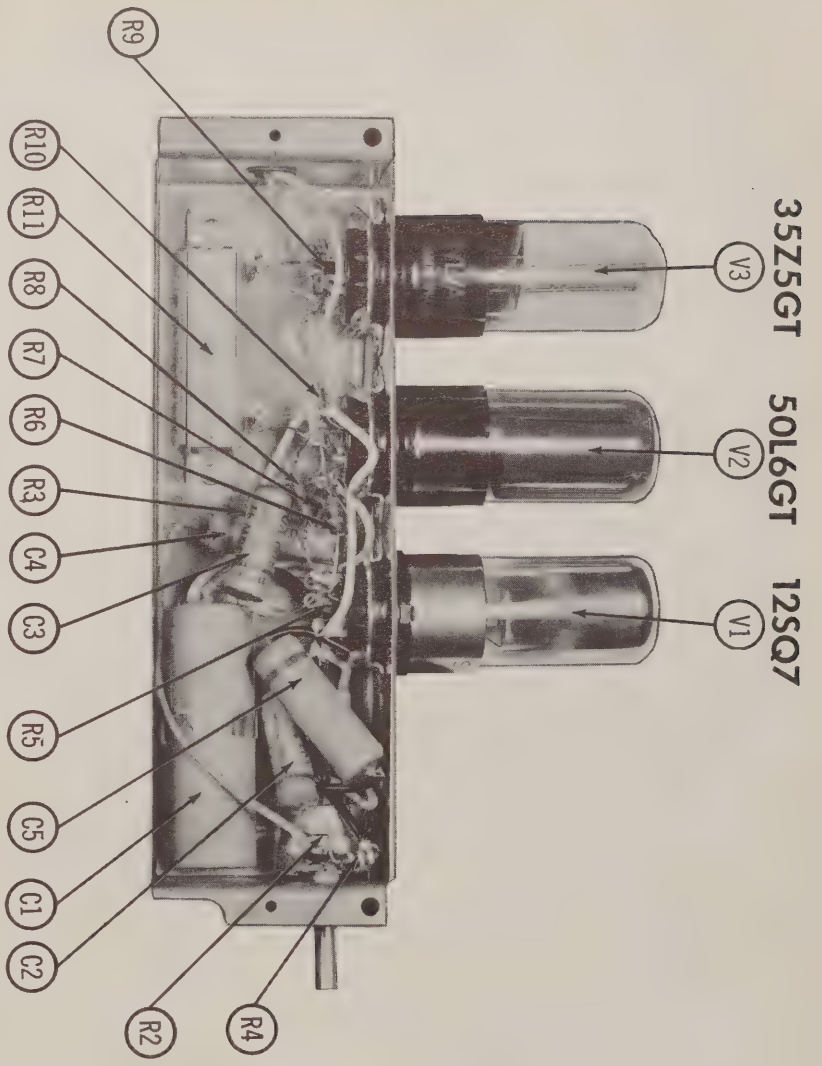
ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V. C. IMP.	REPLACEMENT DATA V-M PART No.	VIKING PART No.	QUAM PART No.	NOTES
SP1	3½"	PM	3.5Ω		46J6	46A07	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA V-M PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	SHURE PART No. CARTRIDGE	SHURE PART No. NEEDLE	ELECTRO-VOICE PART No. CARTRIDGE	ELECTRO-VOICE PART No. NEEDLE	REMARKS
M1		ACD-C-J	A-1 & A-3	WC24	A53MG A52A	46 - OT	0-1 & 0-3	

ASTATIC SHURE AND ELECTRO VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENT SEE BELOW.

CHASSIS—BOTTOM VIEW



PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA V-M PART No.	WALCO PART No.	JENSEN PART No.	REMARKS
M2		W-5MGA or W-5MGS and W-5A or W-5S	A75LP or A-85LP and A75 or A85	

PHOTOFACT* Folder

*TRADE MARK

VIDEO PRODUCTS
MODEL 530-DX Series

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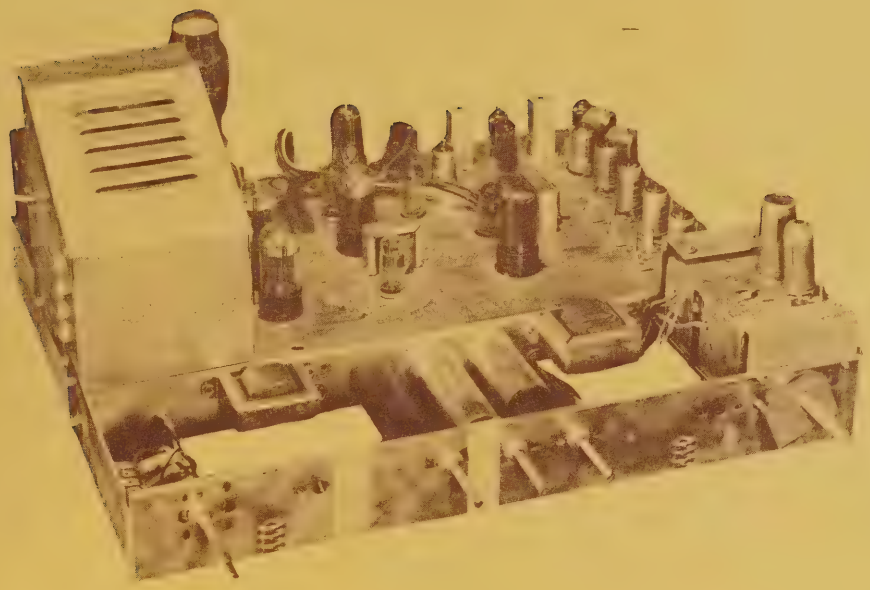

VIDEO PRODUCTS
MODEL 530-DX Series

MODEL 530-DX SERIES

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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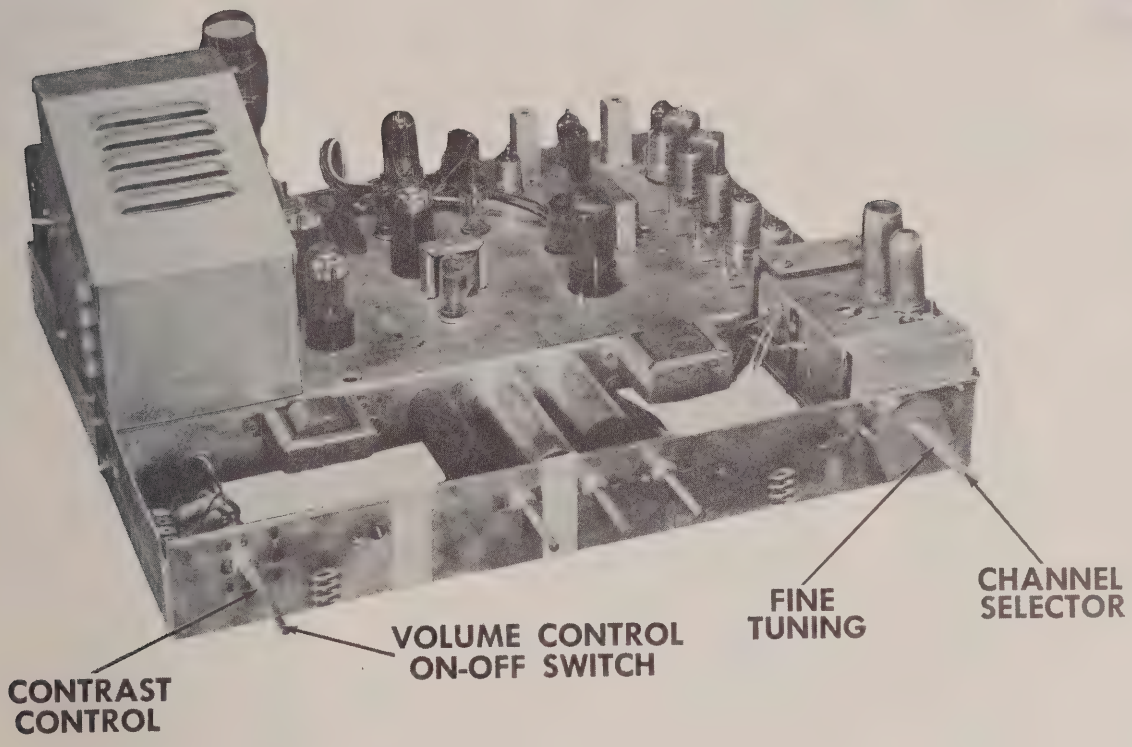
DATE 8-53 SET 213 FOLDER 10



VIDEO PRODUCTS
MODEL 530-DX Series

TRADE NAME	Video Products Model 530DX Series
MANUFACTURER	Video Products, 370 Seventh Ave., Penn. Terminal Bldg., New York, N.Y.
TYPE SET	Television Receiver
TUBES	Twenty-three

POWER SUPPLY 110-120 Volts AAC-60 Cycle RATING 1.64 Amp@ 117 Volts
TUNING RANGE– Channels 2 thru 13, Video IF 26.25MC, Sound IF 21.75MC (Intercarrier)

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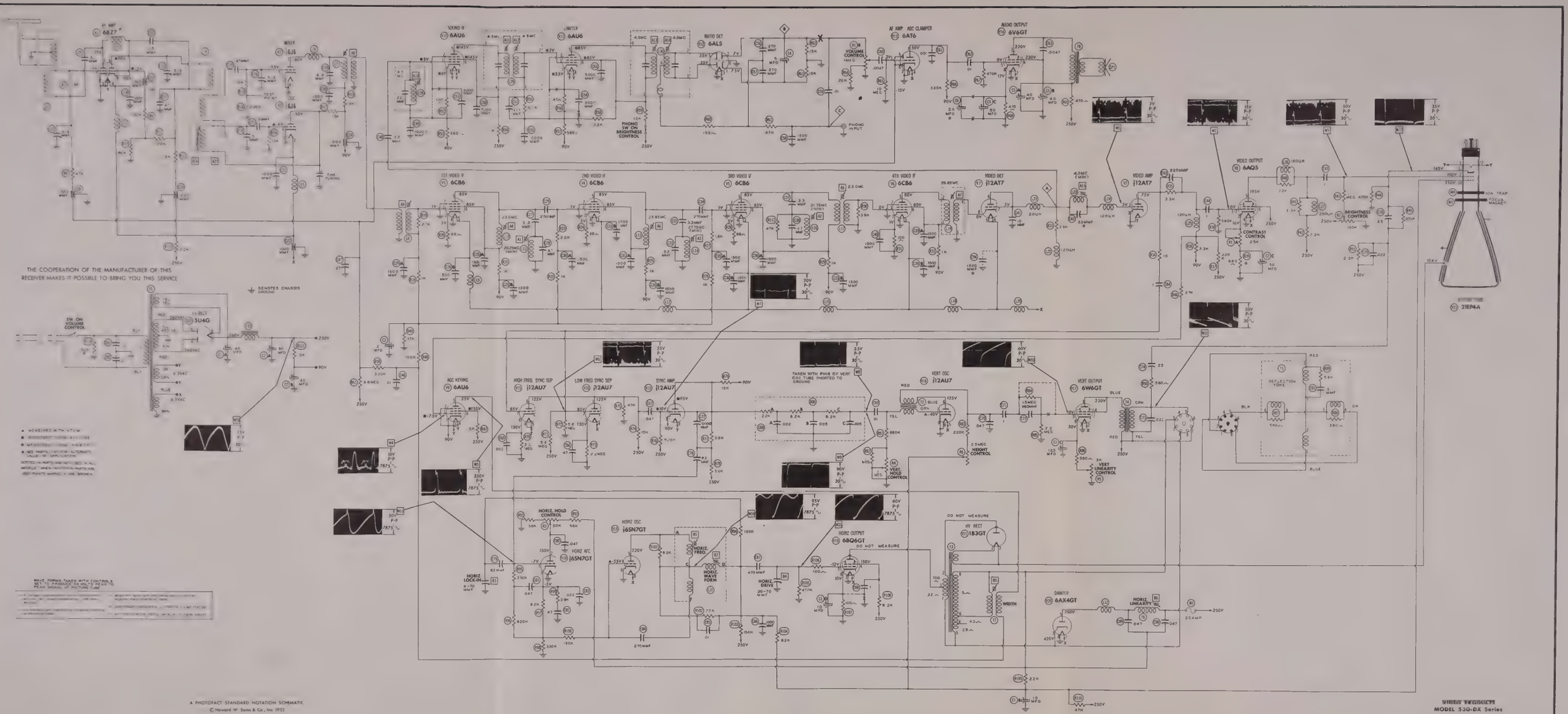
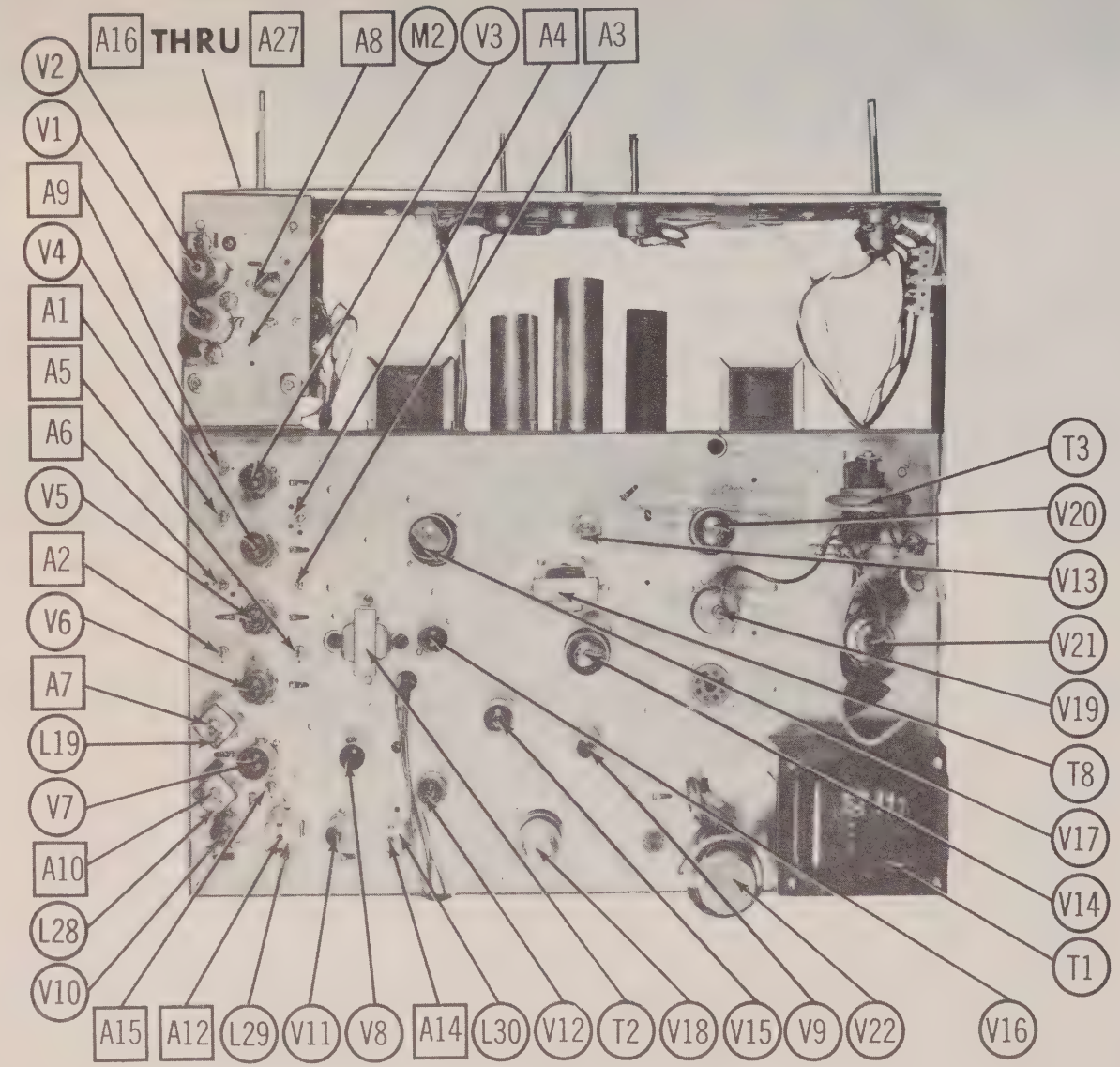


VIDEO PRODUCTS
MODEL 530-DX Series



CHASSIS TOP VIEW

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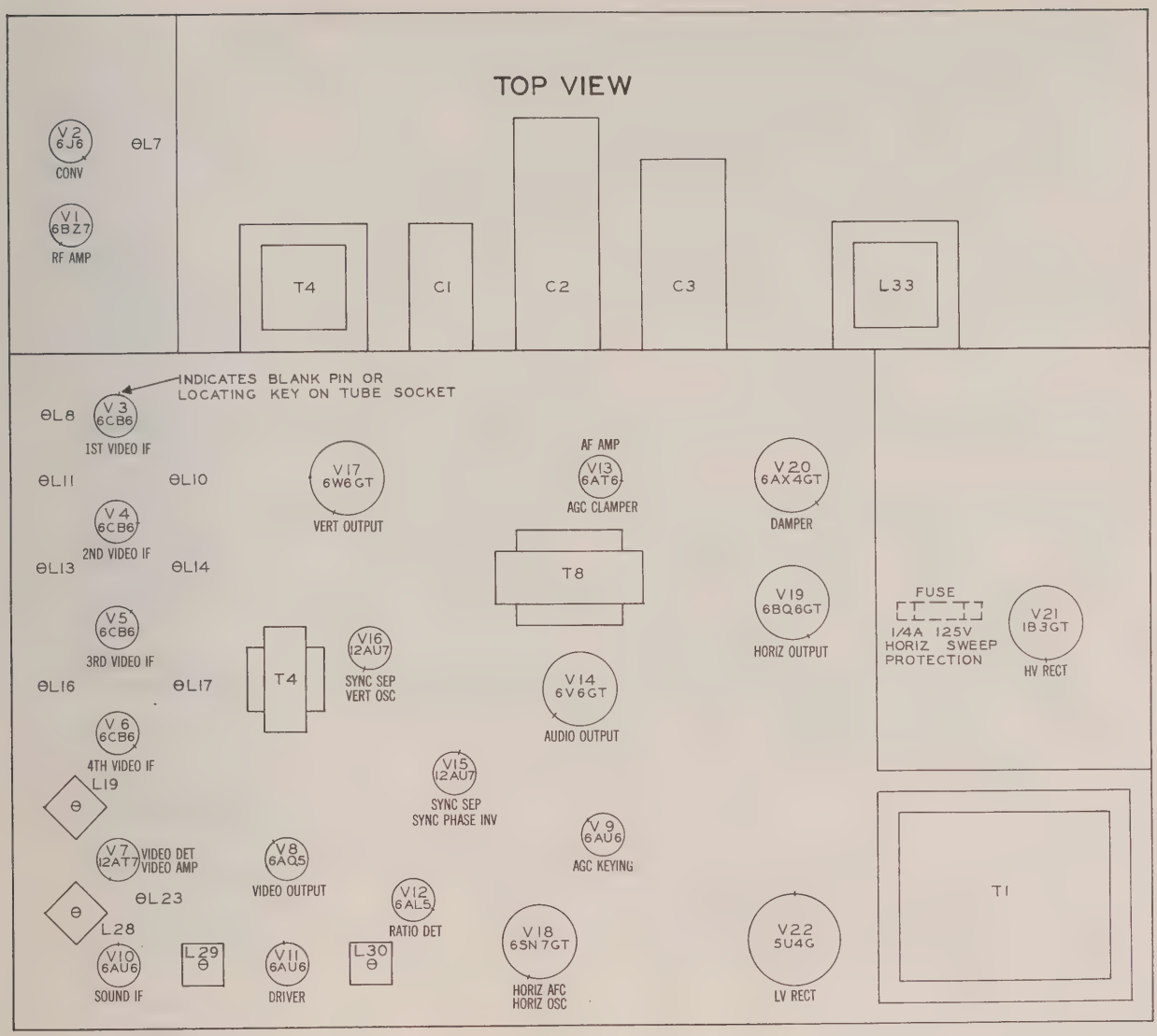
CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - V22

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V6, V7
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster - V7, V8, V23
Has pic, no sound - V10, V11, V12, V13, V14
Overloaded picture - V9

SYNC FAILURE
No vert. sync - V15, V16
No horiz. sync - V15, V18
No vert. or horiz. sync - V15, V16

SWEEP FAILURE
No raster, has sound - V18, V19, V20, V21, V23 Fuse (M1)
No vertical deflection - V16, V17
Poor vert. linearity or foldover - V16, V17
Poor horiz. linearity or foldover - V18, V19, V20
Narrow picture - V18, V19, V20, V21, V22
Vert. off freq. - V15, V16
Horiz. off freq. - V15, V18

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage shock hazard can be eliminated by removing the horizontal oscillator tube, V18.

VIDEO IF ALIGNMENT

Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.
Short the grid (pin 1) of 6AU6 (V9) to chassis.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.01MFD	High side to pin 1 (grid) of 6CB6 (V3). Low side to chassis.	Not used	20.25MC	Any not used locally	Use VTVM. DC probe thru 27KΩ to point (A). Common to chassis.	A1	Adjust for MINIMUM deflection.
2.	"	"	"	21.75MC	"	"	A2	"
3.	"	"	"	27.75MC	"	"	A3	"
4.	"	"	"	23.0MC	"	"	A4, A5	Connect the negative lead of a 1.5 volt battery to the ungrounded side of C3. Connect the positive lead to chassis. Adjust for maximum deflection.
5.	"	"	"	25.65MC	"	"	A6, A7	"
6.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	Set Sweep to a low band channel. (10MC Swp)	21.75MC 26.25MC	Low band channel not used locally.	Vert. amp of scope thru detector (Fig.1) to pin 5 (plate) of 6CB6 (V3). Low side to chassis.	A8, A9	Replace 1.5 Volt battery in step 4 with a 3 Volt battery. Adjust for response curve similar to Fig. 2 .

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.
Connect 3 volt bias battery as in Step 6 of Video IF Alignment.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Direct	High side to an ungrounded tube shield floating over converter tube. Low side to chassis.	24MC (10MC Swp)	20.25MC 21.75MC 22.65MC 26.25MC 27.75MC	Any non-interfering channel	Vert. Amp. thru 27KΩ to point (A). Low side to chassis.		Check for response similar to Fig. 3. If necessary retouch A4 thru A7 for desired response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
8.	.01MFD	High side to pin 1 (grid) of 6CB6 (V6). Low side to chassis.	4.5MC (Unmod.)	Any	DC probe to point (B). Common to chassis.	A10, A11, A12, A13	Adjust for maximum deflection.
9.	"	"	"	"	DC probe to point (C). Common to chassis.	A14	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	.01MFD	High side to pin 1 (grid) of 6CB6 (V6). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. to point (B). Low side to chassis.	A10, A11, A12, A13	Disconnect stabilizing capacitor C4. Adjust for curve of maximum amplitude and symmetry as in Fig. 4.
9.	"	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A14	Reconnect capacitor C4. Adjust so that 4.5 MC occurs at center of crossover lines as in Fig. 5. SLIGHTLY retouch A13 for maximum amplitude and straightness of crossover lines.

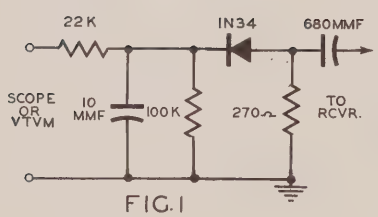


FIG.1

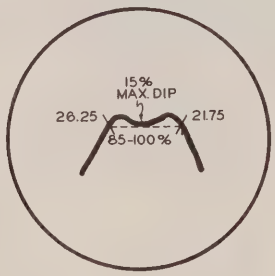


FIG.2

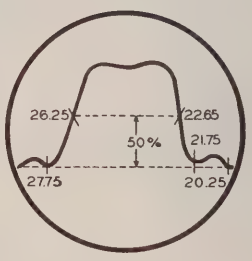


FIG.3

ALIGNMENT INSTRUCTIONS (CONT.)

4.5MC TRAP ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	.01MFD	High side to pin 1 (grid) of 6CB6 (V6). Low side to chassis.	4.5MC (Unmod.)	Any	DC probe thru detector to pin 2 of picture tube. Common to chassis.	A15	Adjust for MINIMUM deflection.

OSCILLATOR ALIGNMENT

The channel oscillator adjustment screws are reached through a hole just to the right of the channel switch shaft. The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 27KΩ to point (A). Low side to chassis.	A16	Adjust to place sound marker in notch as in Fig. 6. Video marker should be at 50%.
			207MC (10MC Swp)	205.75MC 209.75MC	12		A17	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A18	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A19	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A20	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A21	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A22	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A23	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A24	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A25	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A26	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A27	

THE RF AND MIXER PORTION OF THIS RECEIVER HAS BEEN PROPERLY ALIGNED AT THE FACTORY AND IS VERY STABLE. ALIGNMENT OF THIS PORTION SHOULD NOT BE REQUIRED IN THE FIELD.

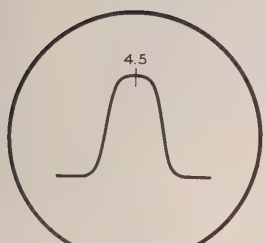


FIG. 4

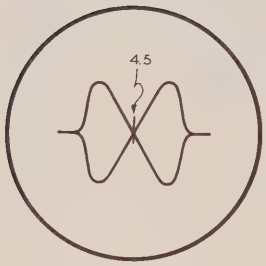


FIG. 5

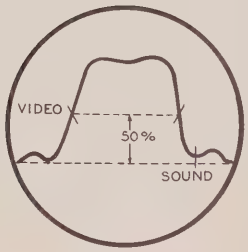
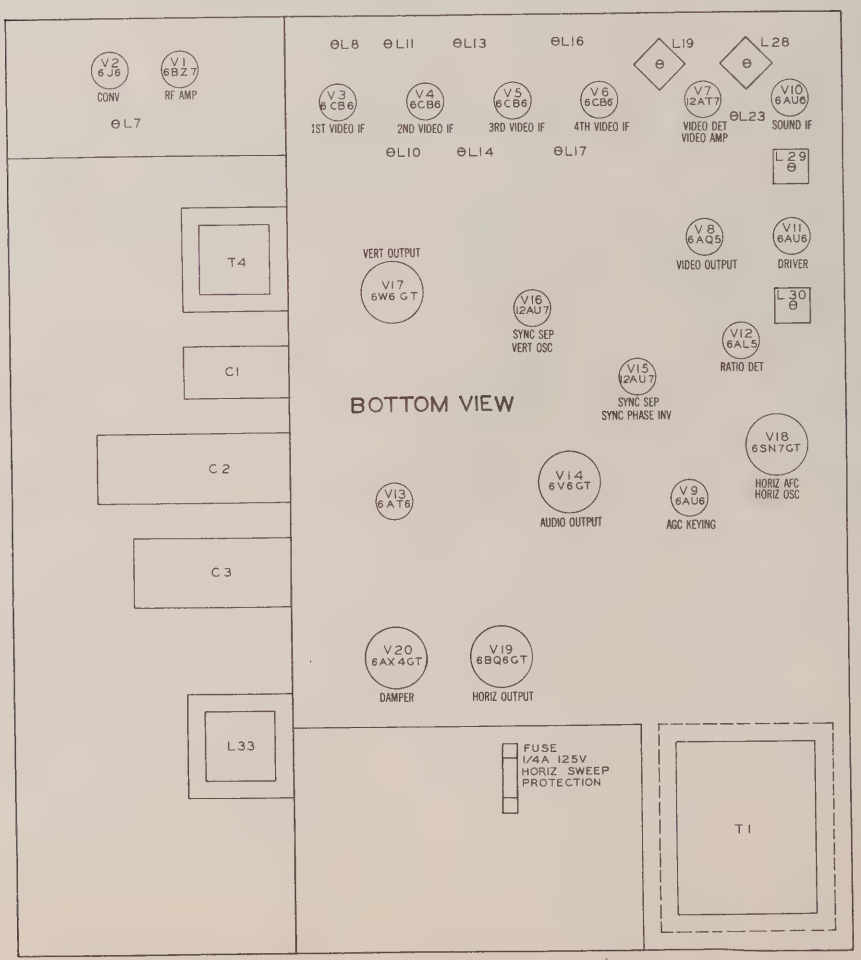


FIG. 6

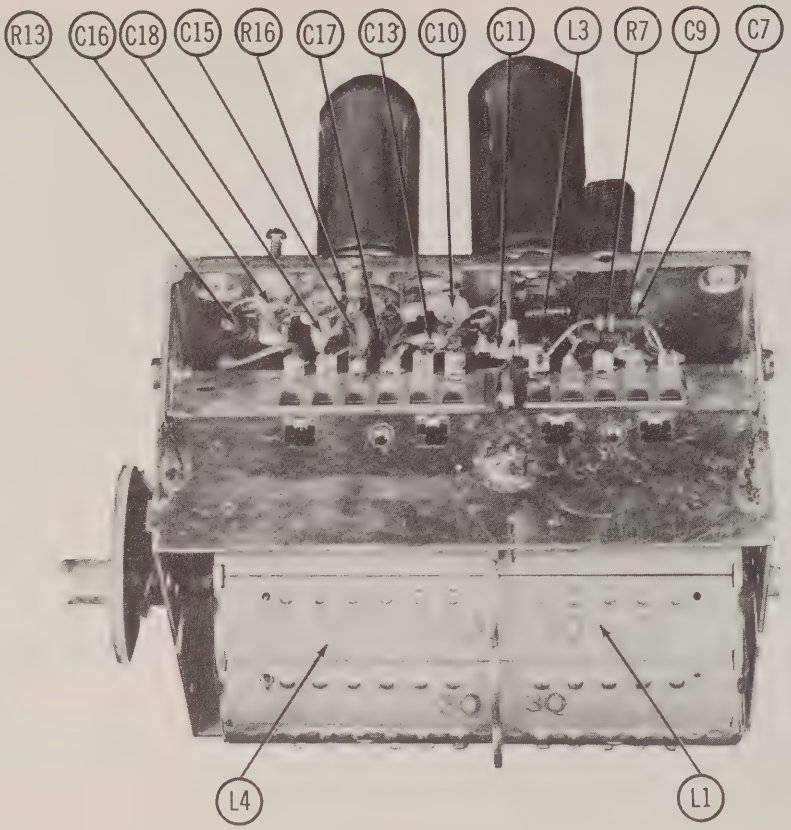
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BZ7	INF	520KΩ	0Ω	.1Ω	0Ω	†3.7KΩ	†170KΩ	INF	0Ω
V 2	6J6	†20KΩ	†1.5KΩ	.1Ω	0Ω	230KΩ	10KΩ	0Ω		
V 3	6CB6	48KΩ	68Ω	.1Ω	0Ω	†6.5KΩ	†6.5KΩ	0Ω		
V 4	6CB6	50KΩ	68Ω	.1Ω	0Ω	†6.5KΩ	†6.5KΩ	0Ω		
V 5	6CB6	50KΩ	68Ω	.1Ω	0Ω	†6.5KΩ	†6.5KΩ	0Ω		
V 6	6CB6	.6Ω	100Ω	.1Ω	0Ω	†6.5KΩ	†6.5KΩ	0Ω		
V 7	12AT7	†12.5KΩ	3.9KΩ	0Ω	.1Ω	.1Ω	3.9KΩ	3.9KΩ	.8Ω	0Ω
V 8	6AQ5	560KΩ	700Ω	.1Ω	0Ω	†2.2KΩ	†53Ω	560KΩ		
V 9	6AU6	†35KΩ	†5.5KΩ	†5.5KΩ	†5.5KΩ	150KΩ	†15KΩ	†5.5KΩ		
V 10	6AU6	†6.1KΩ	†6.2KΩ	†5.5KΩ	†5.5KΩ	†6.5KΩ	†6.5KΩ	†6.2KΩ		
V 11	6AU6	†107KΩ	†6.1KΩ	†5.5KΩ	†5.5KΩ	†7.7KΩ	†7.7KΩ	†6.1KΩ		
V 12	6AL5	15KΩ	15KΩ	0Ω	.1Ω	INF	0Ω	INF		
V 13	6AT6	10Meg	0Ω	0Ω	.1Ω	490KΩ	490KΩ	†335KΩ		
V 14	6V6GT	INF	0Ω	†845Ω	†545Ω	470KΩ	0Ω	.1Ω	†520Ω	
V 15	12AU7	†7.5KΩ	†820 KΩ	†5.5KΩ	†5.5KΩ	†5.5KΩ	†10KΩ	†3Meg	2.2Meg	†5.5KΩ
V 16	12AU7	†13.8KΩ	†3Meg	2.2Meg	.1Ω	.1Ω	†1 Meg	850KΩ	0Ω	0Ω
V 17	6W6GT	INF	.1Ω	†750Ω	†750Ω	2.2Meg	1.1KΩ	0Ω	1.7KΩ	
V 18	6SN7GT	1.5Meg	†60KΩ	410KΩ	480KΩ	†70KΩ	0Ω	0Ω	.1Ω	
V 19	6BQ6GT	†70KΩ	0Ω	INF	†8.2KΩ	470KΩ	470KΩ	.1Ω	100Ω	Top Cap ▲32Ω
V 20	6AX4GT	†61Ω	INF	55KΩ	INF	64Ω	INF	.1Ω	0Ω	
V 21	1B3GT	PINS 1 - 8 HAVE INF RESISTANCE								Top Cap ▲732Ω
V 22	5U4G	INF	30KΩ	INF	7.7Ω	INF	7.4Ω	INF	30KΩ	
V 23	21EP4A	†5.5KΩ	1.1Meg	Pin 10 †35KΩ	Pin 11 †240KΩ	Pin 12 †5.5KΩ				

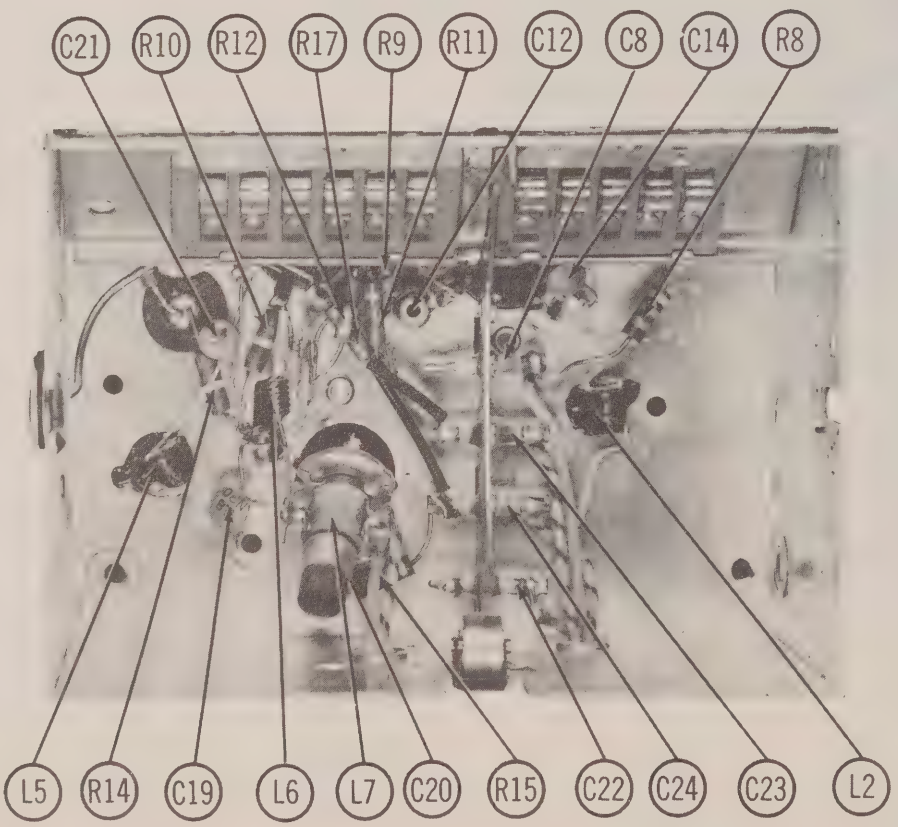
▲ MEASURED FROM PIN 3 OF V20.
† MEASURED FROM PIN 2 OF V22.



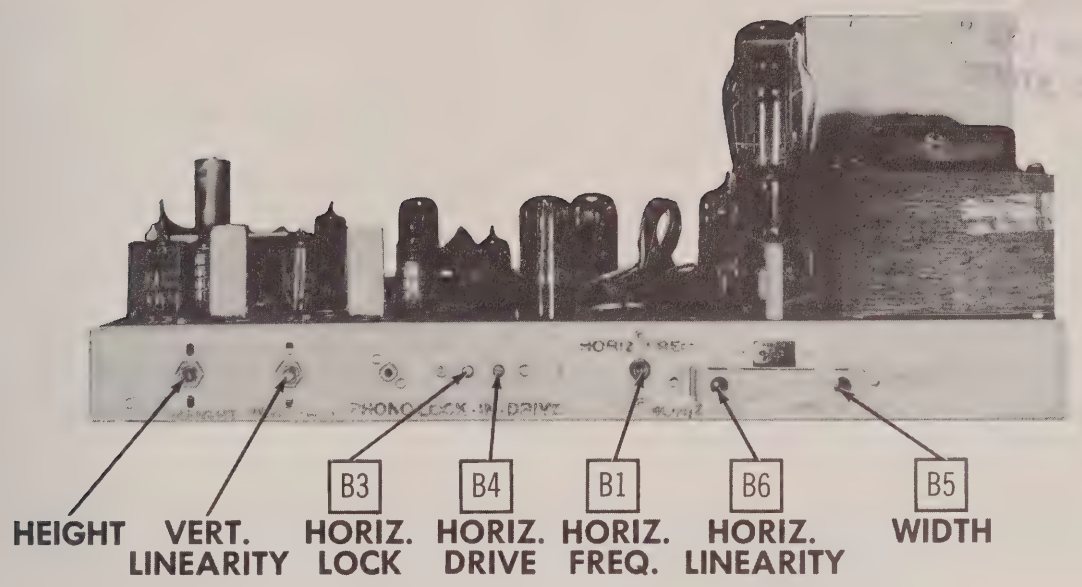
TUBE PLACEMENT CHART



RF TUNER-RIGHT SIDE



RF TUNER-BOTTOM VIEW



CHASSIS–REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV signal, preferably a test pattern.

Turn the horizontal hold control fully clockwise.

The picture show s a tendency to lose sync or lose sync entirely, with up to $4\frac{1}{2}$ diagonal bars sloping down to the right.

Turn the horizontal hold slowly to the extreme counter clockwise position. The picture should remain in sync. Momentarily switch to another channel and back again. The picture should lose sync, with several bars sloping down to the left. If the receiver passes the above checks no horizontal adjustment is necessary.

If horizontal adjustment is necessary, turn the horizontal hold control fully clockwise.

Adjust the horizontal frequency slug (B1) until picture goes out of sync, with a vertical bar or up to $4\frac{1}{2}$ diagonal bars sloping down to the right.

Turn the horizontal hold control fully counter clockwise and momentarily remove the signal so that sync is lost. Turn the hold control slowly clockwise and note the least number of bars just before sync pull in. If the number is more than $3\frac{1}{2}$ adjust the lock-in range trimmer (B3) slightly clockwise. If less than $2\frac{1}{2}$ bars are present at sync lock-in adjust B3 counter clockwise.

HORIZONTAL WAVEFORM ADJUSTMENT

Adjustment of the horizontal waveform slug (B2) should not be made unless it is known to be necessary. Connect the vertical input of an oscilloscope through a low capacity probe to lug "C" of L31. View the waveform on the scope and adjust B2 for broad and narrow peaks of equal height as in Fig. 7. If necessary keep the picture in sync by means of B1 or the horizontal hold control.

DRIVE WIDTH AND LINEARITY ADJUSTMENT

Adjust the horizontal drive trimmer (B4) counter clockwise as far a possible without the presence of vertical white lines or compression of the center of the picture.

Adjust the width slug (B5) for a picture slightly wider than necessary to fill the picture mask horizontally.

Adjust the horizontal linearity slug (B6) for a picture that is symmetrical from left to right.

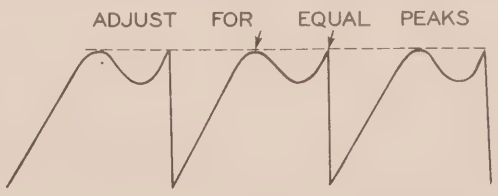


FIG. 7

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under LOSS OF HIGH VOLTAGE.

INSUFFICIENT SWEEP

Substitute V18, V19, V20, and V22. Check amplitude of waveform W15;

If Insufficient	If Sufficient
Check all components of horizontal oscillator. Check coupling network between V18 and V19, Check drive control.	Check components of V19, particularly C88. Check T3, T5A, T7 and associated components. Check damper circuit.

DRIVE LINES

Substitute V18 and V19. Check B4 and coupling network between V18 and V19.

COMPRESSED AT LEFT SIDE

Substitute V19 and V20. Check T3, T5A and T6. Check damper circuit components.

FOLDS

Follow procedure outlined under COMPRESSED AT LEFT SIDE.

VERTICAL

LOSS OF SWEEP

Substitute V16 and V17. Check waveform W10;

If Unsatisfactory	If Satisfactory
Check T2 and other components of the vertical oscillator. Check coupling capacitor between V16B and V17.	Check T4 and T5B. Check other components of the vertical output stage.

INSUFFICIENT SWEEP

Follow procedure outlined under LOSS OF SWEEP. Check power rectifier.

COMPRESSED AT BOTTOM

Substitute V17. Check C1C and C71.

COMPRESSED AT TOP

Substitute V17. Check coupling and waveshaping network between V16B, and V17.

FOLDS

Check coupling and waveshaping network between V16B and V17. Check components of vertical output stage.

SYNC

HORIZONTAL

LOSS OF SYNC

Substitute V15, V16 and V18. Check waveform W13;

If Unsatisfactory	If Satisfactory
Check waveform W7;	Check adjustment of the syncroguide following procedure outlined in alignment section. Check components of V18.

Check waveform W7;

If Unsatisfactory	If Satisfactory
Check components of V15A and V16A. Check coupling system between the video amplifier and the sync clippers. Also check the coupling network between the sync clippers and the syncroguide.	Check components of sync inverter tube and coupling network between V15B and V18.

CRITICAL SYNC

Follow procedure outlined under LOSS OF SYNC.

PULLING PICTURE

Substitute V18. Check coupling capacitor C78 for leakage. Check V19 for filament to cathode leakage.

VERTICAL

LOSS OF SYNC

Substitute V15, V16 and V17. Check waveform W8 and W9;

If Unsatisfactory	If Satisfactory
Check components of V15B and V16A. Check intergrating network.	Check T2 and other components associated with V16B. Check coupling and waveshaping network between V16B and V17.

CRITICAL SYNC

Follow procedure outlined under LOSS OF SYNC.

TRIGGERING

Dress filament leads well away from any grid leads of the vertical oscillator.

VIDEO

SOUND BARS

Check adjustment of A15 (4.5MC Trap) in video amplifier grid circuit. Check local oscillator adjustment and video IF alignment.

POOR RESOLUTION

Check alignment of video. If alignment cannot be brought within tolerance, substitute video IF tubes and check circuit components.

SMEAR

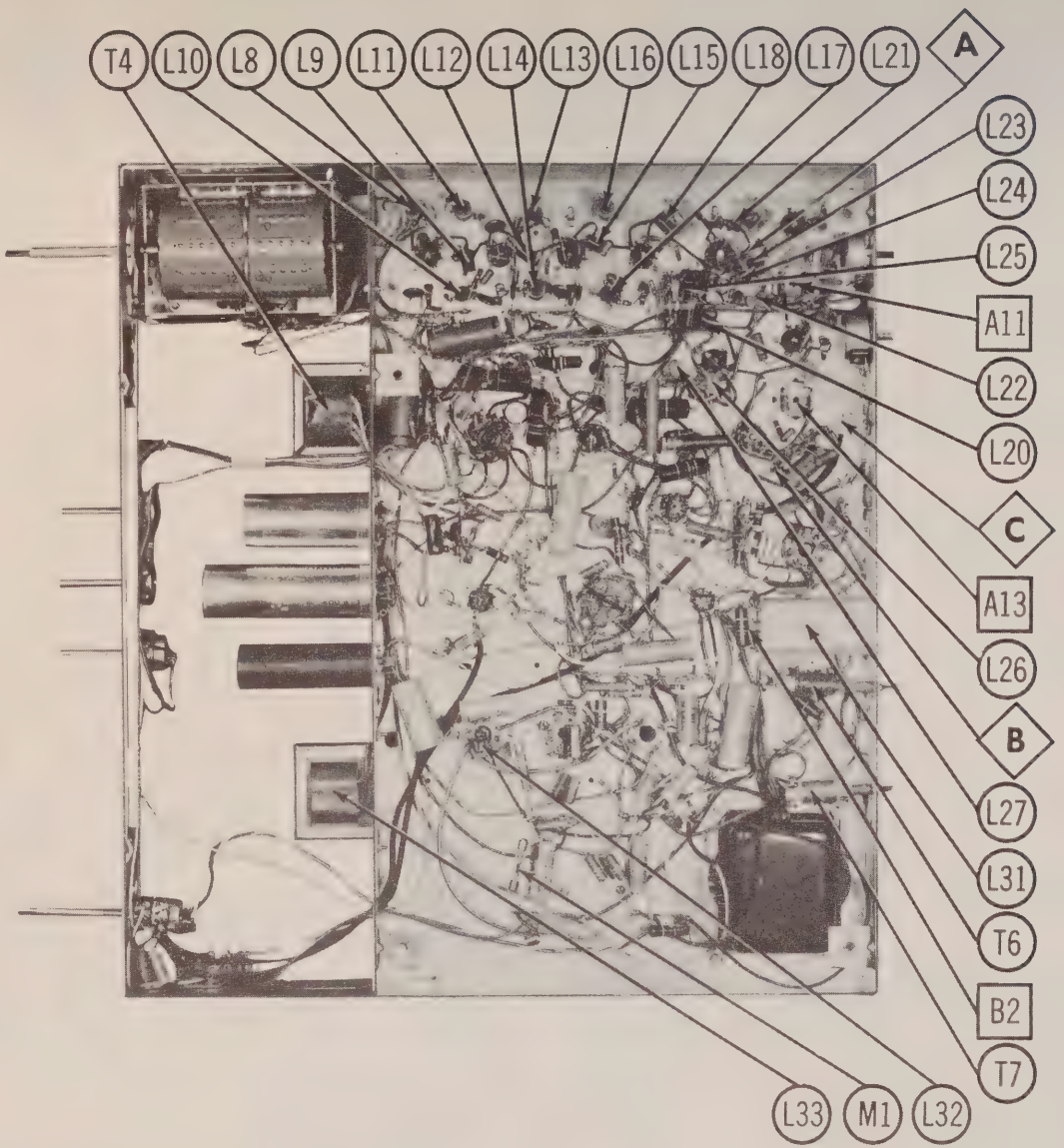
Check plate circuit components of video output stage. Check video IF and detector for overload.

ONE BLACK HORIZONTAL BAR

Check tuner, Video IF, Video detector and video amplifier tubes for filament to cathode leakage.

POOR CONTRAST

Check by substitution, the tuner, video IF and video amplifier tubes. Check video IF alignment. Check picture tube.



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RTMA BASE TYPE	NOTES
V1A	RF Amplifier	6BZ7	6BZ7	9AJ	
B	RF Amplifier	6BQ7	6BQ7	9AJ	
V2	Converter	6J6	6J6	7BF	
V3	Ist. Video IF Amp.	EVT-123	6CB6	7CM	
V4	2nd. Video IF Amp.	EVT-123	6CB6	7CM	
V5	3rd. Video IF Amp.	EVT-123	6CB6	7CM	
V6	4th. Video IF Amp.	EVT-123	6CB6	7CM	
V7	Video Detector - Video Amplifier	EVT-123	12AT7	9A	
V8	Video Output	EVT-126	6AQ5	7BZ	
V9	AGC Keying	EVT-111	6AU6	7BK	
V10	Sound IF Amp.	EVT-111	6AU6	7BK	
V11	Driver	EVT-111	6AU6	7BK	
V12	Ratio Detector	EVT-101	6AL5	6BT	
V13	AF Amplifier - AGC Clamper	EVT-113	6AT6	7BT	
V14	Audio Output	EVT-117	6V6GT	7S	
V15	Sync Separator - Sync Phase Inv.	EVT-124	12AU7	9A	
V16	Sync Separator - Vert. Oscillator	EVT-124	12AU7	9A	
V17	Vert. Output	EVT-125	6W6GT	7S	
V18	Horiz. AFC - Horiz. Oscillator	EVT-104	6SN7GT	8BD	
V19	Horiz. Output	EVT-131	6BQ6GT	6AM	
V20	Damper	EVT-131	6AX4GT	4CG	
V21	HV Rectifier	EVT-105	1B3GT	3C	
V22	LV Rectifier	EVT-109	5U4G	5T	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: SYLVANIA PART No.	RTMA BASE TYPE	NOTES
V23	21EP4A	21EP4A 21EP4 ① 21FP4 ① 21FP4A ①	12D 12D 12C 12C	① Circuit changes necessary.

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CENTRALAB PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: MALLORY PART No.	REPLACEMENT DATA: SPRAGUE PART No.	NOTES
C1A	±60	375							TVL-4753	
B	±10	450	ECE-1003	AFH4-123					TVA-1311	
C	±125	50								
D	10	50								
C2A	±80	400		AFH3-91		BOT2		FP229.3	TVL-2710	
B	±80	400	ECE-1001			BR6045A				
C	±50	50		PRS450/80			TC39		TVA-1716	
C3	2	50	ECE-2003	PRS150/4		BBR3-50T	TC302		TVA-1381	
C4	5	50	ECE-2001	PRS150/4		BR550	TC30		TVA-1303	
C5A	±40	400		AFH1-52						
B	±40	400	ECE-1003	PRS450/50						
C	50	50								
C6	20	150		PRS150/20		BR2015A		TC45	TVA-1410	Note 1
C7	3-9				829-10			C7565A		
C8	1000			CN-1-001	MFT-1000				503C-D1	
C9	3			SI3NP0			NP0K-030	ZT-553		
C10	1.5			SI1.5NP0	TCZ-1.5		NP0K-1R5	ZT-5515	5TCCB-V15	
C11	1090			CN-1-001	MFT-1000				503C-D1	
C12	.5-3				829-3			C7565A		
C13	47									
C14	1000			BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C15	47			SI47NT50	TCN-47		N750K-470	NT-5447	5TCU-Q47	
C16	5-3				829-3			C7565A		
C17	10			SI0NP0	TCZ-10		NP0K-100	ZT-541	5TCC-Q1	
C18	5			SI5NT50	TCN-5		N750K-050	NT-555	5TCUB-V5	
C19	6.8			SI6.8NP0	TCZ-6.8		NP0K-6R8	ZT-5548	5TCCB-V68	
C20	1000			BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C21	1000			BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C22	1000			CN-1-001	MFT-1000				503C-D1	
C23	1000			CN-1-001	MFT-1000				503C-D1	
C24	1000			CN-1-001	MFT-1000				503C-D1	
C25A	1500		C-60-5M-152	BPD-2X0015	DD-2-152	TM5DD15	812-0015	DCD-5215	5HK-2D15	
B	1500									
C26A	1500		C-60-5M-152	BPD-2X0015	DD-2-152	TM5DD15	812-0015	DCD-5215	5HK-2D15	
B	1500									
C27	3.3		C-20-5F-330	SI3.3NP0	TCZ-3.3		NP0K-3R3	ZT-5533	5TCCB-V33	
C28	67			SI68NP0	TCZ-68		NP0-333-670		5TCC-Q68	
C29	270		C-30-5G-271	SI270	D6-271		GP2K-271	UC-5327	5GA-T27	
C30A	1500		C-60-5M-152	BPD-2X0015	DD-2-152	TM5DD15	812-0015	DCD-5215	5HK-2D15	
B	1500									
C31A	1500		C-60-5M-152	BPD-2X0015	DD-2-152	TM5DD15	812-0015	DCD-5215	5HK-2D15	
B	1500									
C32	3.3		C-20-5F-330	SI3.3NP0	TCZ-3.3		NP0K-3R3	ZT-5533	5TCCB-V33	
C33	33									
C34	270		C-30-5G-271	SI270	D6-271		GP2K-271	UC-5327	5GA-T27	
C35A	1500		C-60-5M-152	BPD-2X0015	DD-2-152	TM5DD15	812-0015	DCD-5215	5HK-2D15	
B	1500									
C36A	1500		C-60-5M-152	BPD-2X0015	DD-2-152	TM5DD15	812-0015	DCD-5215	5HK-2D15	
B	1500									
C37	3.3		C-20-5F-330	SI3.3NP0	TCZ-3.3		NP0K-3R3	ZT-5533	5TCCB-V33	
C38	47			SI47NT50	TCN-47		N7550K-470	NT-5447	5TCU-Q47	
C39A	1500		C-60-5M-152	BPD-2X0015	DD-2-152	TM5DD15	812-0015	DCD-5215	5HK-2D15	
B	1500									
C40	1500		C-40-5M-152	SI1500	D6-152	TM5D15	GP2L-152	UC-5215	5HK-D15	
C41	10		C-20-5F-100							
C42	33									Note 2
C43	220			SI220	D6-221		GP2K-221	UC-5322	5GA-T22	

PARTS LIST AND DESCRIPTIONS

CAPACITORS (CONT.)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CENTRALAB PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: MALLORY PART No.	REPLACEMENT DATA: SPRAGUE PART No.	NOTES
C44	.1	400	P-60-L-104	P488-1	DF-104	PTE4P1		PT401	4TM-P1	
C45	.1	400	P-60-L-104	P488-1	DF-104	PTE4P1		PT401	4TM-P1	
C46	.01	400	P-60-L-103	P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C47	.27	200	P-60-K-274	P488-25		PJ2P25		PT4025	2TM-P25	
C48	3.3		C-20-5F-330	SI3.3NP0	TCZ-3.3		NP0K-3R3	ZT-5533	5TCCB-V33	
C49	10000		C-40-5M-103	BPD-01	DD-1032	TM5S1	811-01	DC-511	5HK-S1	
C50	5000		C-40-5M-503	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C51	5000		C-40-5M-503	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C52	100		C-20-5F-101	SI100	D6-101	TM5T1	GP2K-101	UC-531	5GA-T1	
C53	5000		C-40-5M-503	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C54	5000		C-40-5M-503	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C55	10000		C-40-5M-103	BPD-01	DD-1032	TM5S1	811-01	DC-511	5HK-S1	
C56	270		C-20-5G-271	SI270	D6-271		GP2K-271	UC-5327	5GA-T27	
C57	270		C-20-5G-271	SI270	D6-271		GP2K-271	UC-5327	5GA-T27	
C58	1500		C-20-5G-152	SI1500	D6-152	TM5D15	GP2L-152	UC-5215	5HK-D15	
C59	.01	400	P-40-L-103	P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C60	.0047	400	P-40-L-472	P488-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	
C61	.001	400	P-40-L-102	P488-001	D6-102	PTE6D1	GP2L-102	PT601	6TM-D1	
C62	.01	400	P-40-L-103	P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C63	.0047	1000	P-40-N-472	P1088-0047	DD-16-502	PTE16D47		PT16247	MD-D47	
C64	.1	400	P-60-L-104	P488-1	DF-104	PTE4P1		PT401	4TM-P1	
C65	.002	600	P-40-L-222	P688-002	D6-202	PTE6D2	GP2-333-202	PT622	6TM-D2	
C66	.47	200	P-40-K-474	P288-47		PJ2P5		PT405	2TM-P47	
C67	.047	400	P-60-L-473	P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C68A	.002			P688-002		PTE6D2		PT622		
B	.005		⊕ENW-101	P688-005	⊕PC-100	PTE6D5	⊕1405-01	PT625	⊕105C1	
C	.005			P688-005		PTE6D5		PT625		
C69	.01	400		P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C70	.047	600	P-60-M-473	P688-047	DF-503	PTE6S47		PT6147	6TM-S47	
C71	.1	600	P-60-M-104	P688-1	DF-104	PTE6P1		PT601	6TM-P1	
C72	680	500	M-60-57-681	1679-0007		2B57T7			MD-S7	
C73	.022	400	P-40-L-223	P488-022	DD-203	PTE4S22		PT4122	4TM-S22	
C74	.25	400	P-40-L-254	P488-25		PJ2P25		PT4025	2TM-P25	
C75	.022	400	P-40-L-223	P488-022	DD-203	PTE4S22		PT4122	4TM-S22	
C76	.25	400	P-40-L-254	P488-25		PJ2P25		PT4025	2TM-P25	
C77	10000		C-40-5M-103	BPD-01	DD-1032	TM5S1	GP2-333-103	DC-511	5HK-S1	
C78	82	500	M-60-57-820							
C79	82	500	M-60-57-820							
C80	.047	400	P-40-L-473	P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C81	.047	400	P-40-L-473	P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C82	.47	200	P-40-K-474	P288-47		PJ2P5		PT405	2TM-P47	
C83	.022	400	P-40-L-223	P488-022	DD-203	PTE4S22		PT4122	4TM-S22	
C84	270	1000	M-40-ME-271					MC8327		
C85	.01	400	P-60-L-103	P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C86	1000	1000	M-60-10F-102	1671L-HV-001		1HP15D1		MCK210		
C87	470	500		1605-0005		5R5T5		MC3245		
C88	.1	400	P-40-L-104	P488-1	DF-104	PTE4P1		PT401	4TM-P1	
C89	.047	400	P-40-L-503	P488-047		PTE4S47		PT4147	4TM-S47	
C90	.047	400	P-40-L-503	P488-047		PTE4S47		PT4147	4TM-S47	
C91	51	1500								
C92	.01	400	B-80-L-103	489ZX-01			P2481	PT411	4TM-S1	
C93	.01	400	B-80-L-103	489ZX-01			P2681	PT411	4TM-S1	
C94	1500		C-40-5M-152	BPD-0015	DD-152	TM5D15	801-0015	UC-5215	5HK-D15	Note 1

Note 1, Not used in all Models.
Note 2, Some Models use 47MMF in this application.
* Items C88A, C88B, C88C, R80A, R80B, R80C are combined in one unit.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	REPLACEMENT DATA: CENTRALAB PART No.	REPLACEMENT DATA: MALLORY PART No.	INSTALLATION NOTES
R1A	2500Ω	½	EP-114A	QJ-465 *			UF2521, † UR16T254 †	Contrast-Panel
B	1Meg	½					US-26	Volume-tapped ⑤ 250KH-Rear
C	Switch						US-26	Attach to R1A
R2A	150KΩ	½	EP-117A	QU-129	AG-52-S	AB-46	U-48	Brightness
B	Shaft		Not Req.	Not Req.	KS3-3	AK-4	Not Req.	Attach to R2A
C	Switch		Not Req.	76-1	SWB	KB-1	US-26	Attach to R2A
R3A	50KΩ	½	EP-118A	QU-133	AG-44-S	AB-51	U-35	Horiz. Hold
B	Shaft		Not Req.	Not Req.	KS3-3	AK-4	Not Req.	Attach to R3A
R4A	1Meg	½	EP-116	QU-137	AG-81-S	AB-69	U-54	Vert. Hold
B	Shaft		Not Req.	Not Req.	KS3-3	AK-4	Not Req.	Attach to R4A
R5A	3000Ω	2	EP-118A	WK-3000	A43-3000	VK-133	R3000L	Vert. Linearity-Wire Wound
B	Shaft		Not Req.	Not Req.	FK3-1/4	Not Req.	Not Req.	Attach to R5A
R6A	2.5Meg	½	EP-101A	QU-239	AG-84-S	AB-83	2U-565	Height
B	Shaft		Not Req.	Not Req.	FK3-1/4	AK-1	Not Req.	Attach to R6A

* CONCENTRIKIT EQUIVALENT - KIT K-2, BASE ELEMENTS & SHAFTS B17-111 & P1-212 (Panel) B13-137X & R1-223 (Rear) & SWITCH 76-1.
† Universal Replacement -(Mallory exact duplicate part #UR3708).

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R1	15KΩ	½		BTS-15K	
R2	47KΩ	½			
R3	100KΩ	½		BTS-100K	
R4	160KΩ-5%	½		BTS-160K-5%	
R5	150Ω	½		BTS-150Ω	
R6	100KΩ-5%	½		BTS-100K-5%	
R7	10KΩ	½		BTS-10K	
R8	220KΩ	½		BTS-220K	
R9	100Ω	½		BTS-100Ω	
R10	1000Ω	½		BTS-1000Ω	
R11	1500Ω	½		BTS-1500Ω	
R12	100KΩ-5%	½		BTS-100K-5%	
R13	10K	½		BTS-10K	
R14	220KΩ	½		BTS-220K	
R15	10KΩ	½			
R16	10KΩ	½		BTS-10K	
R17	15KΩ	½		BTS-15K	
R18	1000Ω	½	KRA-1021	BTS-1000	
R19	2700Ω-5%	½	KRA-2725	BTS-2700-5%	Note 1
R20	68Ω	½	KRA-6801	BTS-68	
R21	1000Ω	½	KRA-1021	BTS-1000	
R22	1000Ω	½	KRA-1021	BTS-1000	
R23	22000Ω-5%	½	KRA-2225	BTS-2200-5%	
R24	68Ω	½	KRA-6801	BTS-68	
R25	1000Ω	½	KRA-1021	BTS-1000	
R26	1000Ω	½	KRA-1021	BTS-1000	
R27	18000Ω-5%	½	KRA-1835	BTS-1800-5%	
R28	68Ω	½	KRA-6801	BTS-68	
R29	1000 Ω	½	KRA-1021	BTS-1000	
R30	39000Ω-5%	½	KRA-3925	BTS-3900-5%	
R31	100Ω	½	KRA-1011	BTS-100	
R32	1000Ω	½	KRA-1021	BTS-1000	
R33	3900Ω-5%	½	KRA-3925	BTS-3900-5%	
R34	10KΩ	½	KRA-1031	BTS-10K	
R35	3300Ω	½	KRA-3321	BTS-3300	
R36	3300Ω	½	KRA-3321	BTS-3300	
R37	220KΩ	½	KRA-2241	BTS-220K	
R38	560KΩ	½	KRA-5641	BTS-560K	
R39	680Ω	½	KRA-6811	BTS-680	
R40	22KΩ	½	KRA-2231	BTS-22K	
R41	3300Ω	½	KRA-3321	BTS-3300	
R42	3200Ω	5	ERD-318		
R43	1 Meg	½	KRA-1051	BTS-1 Meg	
R44	470KΩ	½	KRA-4741	BTS-470K	
R45	470KΩ	½	KRA-4741	BTS-470K	
R46	27KΩ	½	KRA-2731	BTS-27K	

RESISTORS (CONT.)

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R47	15KΩ	½	ERA-1631	BTS-15K	
R48	100KΩ	½	ERA-1041	BTS-100K	
R49	47KΩ	½	ERA-4731	BTS-47K	
R50	330KΩ	½	ERA-3341	BTS-330K	
R51	6.8Meg	½	ERB-6851	BTA-6.8Meg	
R52	100Ω	½	ERA-1011	BTS-100	
R53	560Ω	½	ERA-5611	BTS-560	
R54	1000Ω	½	ERA-1021	BTS-1000	
R55	100KΩ	½	ERA-1041	BTS-100K	
R56	47Ω	½	ERA-4701	BTS-47	
R57	560Ω	½	ERA-5611	BTS-560	
R58	22KΩ	½	ERA-2231	BTS-22K	
R59	10KΩ	1	ERB-1031	BTA-10K	
R60	150Ω	½	ERA-1511	BTS-150	
R61	47KΩ	½	ERA-4731	BTS-47K	
R62	15KΩ	½	ERA-1531	BTS-15K	
R63	15KΩ	½	ERA-1531	BTS-15K	
R64	22KΩ	½	ERA-2231	BTS-22K	
R65	10Meg	½	ERA-1081	BTS-10Meg	
R66	330KΩ	½	ERA-3341	BTS-330K	
R67	470KΩ	½	ERA-4741	BTS-470K	
R68	470Ω	1	ERB-4711	BTA-470	
R69	470Ω	2	ERC-4711	BTB-470	
R70	2.2Meg	½	ERA-2251	BTS-2.2Meg	
R71	5.6Meg	½	ERA-5651	BTS-5.6Meg	
R72	5.6Meg	½	ERA-5651	BTS-5.6Meg	
R73	2.2Meg	½	ERA-2251	BTS-2.2Meg	
R74	15KΩ	1	ERB-1531	BTA-15K	
R75	47KΩ	2	ERC-4731	BTB-47K	
R76	820KΩ	½	ERA-8241	BTS-820K	
R77	5600Ω	1	ERB-5621	BTA-5600	
R78	5600Ω	1	ERB-5621	BTA-5600	
R79	15KΩ	½	ERA-1531	BTS-15K	
R80A	22KΩ	½		BTS-22K	
B	8200Ω	½	⊕ENW-101	BTS-8200	
C	8200Ω	½		BTS-8200	
R81	680KΩ	1	ERB-6841	BTA-680K	
R82	1 Meg	½	ERA-1051	BTS-1 Meg	
R83	220KΩ	½	ERA-2241	BTS-220K	
R84	1.5Meg	½	ERA-1551	BTS-1.5Meg	
R85	2.2Meg	½	ERA-2251	BTS-2.2Meg	
R86	560Ω	½	ERA-5601	BTS-560	
R87	560Ω	½	ERA-5601	BTS-560	
R88	560Ω	½	ERA-5601	BTS-560	
R89	5600Ω	½	ERA-5621	BTS-5600	
R90	560Ω	½	ERA-5611	BTS-560	
R91	2200Ω	½	ERA-2221	BTS-2200	
R92	56KΩ	½	ERA-5631	BTS-56K	
R93	56KΩ	1	ERB-5631	BTA-56K	
R94	150KΩ	½	ERA-1541	BTS-150K	
R95	330KΩ	½	ERA-3341	BTS-330K	
R96	820KΩ	½	ERA-8241	BTS-820K	
R97	82KΩ-5%	½	ERB-8235	BTA-82K-5%	
R98	330KΩ-5%	½	ERB-3345	BTA-330K-5%	
R99	3900Ω	½	ERA-3921	BTS-3900	
R100	150KΩ-5%	½	ERB-1545	BTA-150K-5%	
R101	8200Ω-5%	½	ERA-8225	BTS-8200-5%	
R102	27KΩ	½	ERA-2731	BTS-27K	
R103	150KΩ	½	ERA-1541	BTS-150K	
R104	82KΩ	½	ERA-8231	BTS-82K	
R105	470KΩ	½	ERA-4741	BTS-470K	
R106	100Ω	½	ERA-1011		
R107	100Ω	2	ERC-1011	BW-2-100	
R108	8200Ω	2	ERC-8221	BTB-8200	
R109	22KΩ	1	ERB-2231	BTA-22K	
R110	47KΩ	½	ERA-4731	BTS-47K	
R111	10KΩ	5	ERD-122		
R112	47KΩ	½	ERA-4731	BTS-47K	
R113	2200Ω	1	ERB-2221	BTA-2200	
R114	150KΩ	½	ERA-1541	BTS-150K	Note 2

Note 1. Some models may use a 5800 resistors in this application.
* Items R80A, R80B, R80C, C68A, C68B, C68C are combined in one unit.
Note 2. Not used in all models.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	REPLACEMENT DATA: TRIAD PART No.	REPLACEMENT DATA: RCA TYPE No.
T1	117VAC ⑨ 1.54A	520VCT .200ADC	5VAC ⑨ 3A	6.3VAC ⑨ 1.76A SEC. 4 6.3VAC ⑨ 8.3A	ET-111-2	P-8167①	P-3076			

① Drill new mounting holes.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI.	RATING: DC RESISTANCE SEC.	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	REPLACEMENT DATA: TRIAD PART No.	REPLACEMENT DATA: RCA TYPE No.	NOTES
T2	270Ω	920Ω	ET-115	A-8111	A-3000	TBO-5 ①	A-97X	20ST2 ⑫	Vert. Osc. Trans.
T3	806Ω tap	0Ω	ET-112A	A-8135 ①	KVO-9 ① ②	TFB-11 ③	D-19 ① ⑤	23GT1 ⑫	Horiz. Output Trans.
	⑨ 80, 480, 760, 108Ω			④					
T4	700Ω	7Ω	ET-130	A-8115 ⑤	A-3036	TSO-5 ①	A-96X ①	20ST2 ⑫	Vert. Output Trans.
T5A	21Ω		EL-173B	DY-11A ⑥		TY-7 ③	Y-19 ③		Horiz. Deflection Coils
B	14Ω		EL-173 ⑦						Vert. Deflection Coils
T6	8Ω		EL-180				WC-12 ⑩	21SR1	Horiz. Linearity Coil
T7	7Ω	83Ω	EL-181						Width & AGC Coil

① Drill one new mounting hole.
② Connect original terminal #3 to new terminal #4, original terminals 7 and 5 to new terminal 3, original terminal 6 to new terminal 2 and original terminal 8 to new terminal 1.
③ Connect original terminal 3 to new terminal 9, original terminal 7 and 5 to new terminal 7, original terminal 7 to new terminal 3 and original terminal 8 to new terminal 1.
④ Wire as in original circuit.
⑤ Connect terminal 7 to terminal 6, then connect original terminals 7 and 5 to new terminal 7 or 8. Original terminal 6 to new terminal 3. Original terminal 8 to new terminal 1.
⑥ Drill new mounting holes.
⑦ Alternate deflection yoke.
⑧ Use original horiz. deflection coil network if necessary.
⑨ Use original deflection coil network.
⑩ Connect to coded blue and red terminals.
⑪ Connect original terminal #3 to new terminal #9, original terminals 7 and 5 to new terminal #7, original terminal #6 to new terminal #3 and original terminal #8 to new terminal #1.
⑫ Mount on top of chassis.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	REPLACEMENT DATA: TRIAD PART No.	NOTES
T8	5KΩ	3.1Ω	330Ω	.8Ω	ET-109-2	A-3877	A-2930	RO-9 ①	S-3X	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: JENSEN PART No.	REPLACEMENT DATA: QUAM PART No.	NOTES
SP1	6"	PM	3.1Ω		ST-108 Mod. P6-X	6AI	

VIDEO PRODUCTS
MODEL 530-DX Series

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: MEISSNER PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: MILLER PART No.	NOTES
L1	Ant. Coils	0Ω CT	0Ω					
L2	Fil. Choke	0Ω						
L3	Neutr. Coil	0Ω						
L4	RF, Mixer Grid & Osc. Coils	0Ω						
L5	Fil. Choke	0Ω						
L6	RF Choke	0Ω						
L7	Conv. Plate	.6Ω	.1Ω					
L8	1st. Video IF	.1Ω	.1Ω	EL-163	17-1063			
L9	Fil. Choke	0Ω		EL-474			4604	1.6 Microhenries
L10	2nd. Video IF	.3Ω		EL-162	17-1004	TV-103 *	6189 *	
L11	Adj. Channel picture trap	0Ω		EL-183		TV-112 *	6171 *	
L12	Fil. Choke	0Ω		EL-474			4604	1.6 Microhenries
L13	3rd. Video IF	.3Ω		EL-162	19-1020	TV-112 *	6171 *	
L14	Adj. Channel Sound Trap	0Ω		EL-182	20-1006		6171A *	
L15	Fil. Choke	0Ω		EL-474			4604	1.6 Microhenries
L16	Sound Carrier Trap	0Ω		EL-164		TV-112 *	6171 *	
L17	4th. Video IF	.6Ω	.6Ω	EL-161	17-1063			
L18	Fil. Choke	0Ω		EL-474			4604	1.6 Microhenries
L19	5th. Video IF	.8Ω	.8Ω	EL-171				
L20	Fil. Choke	0Ω		EL-474			4604	1.6 Microhenries
L21	Series Peaking Coil	2.9Ω		EL-172		TV-180	6176	20 Microhenries
L22	Shunt Peaking Coil	5Ω		EL-167	19-3125			120 Microhenries
L23	4.5MC Trap	2.2Ω		EL-184	20-1004	TV-151	1470	
L24	Series Peaking Coil	5Ω		EL-167	19-3125			120 Microhenries
L25	Shunt Peaking Coil	7.5Ω		EL-167	19-3125			120 Microhenries
L26	Series Peaking Coil	10Ω		EL-168	19-3180	TV-184	6180	180 Microhenries
L27	Shunt Peaking Coil	7.5Ω		EL-158	19-3250	TV-185	6181	250 Microhenries
L28	1st. Sound IF	3.2Ω		EL-175	17-1031			
L29	2nd. Sound IF	2Ω	2Ω	EL-152		TV-113	6203	
L30	Ratio Det.	5.5Ω	2Ω CT	EL-153	17-3497	TV-115	6205	Tertiary Winding -.8Ω
L31	Horiz. Osc.	125Ω		ET-100B	20-1402	TV-162	6183	Tapped ⓐ 90Ω, wave-form winding -32Ω
L32	RF Choke	2.9Ω		EL-172		TV-180	6176	20 Microhenries

* Enlarge mounting hole.

FILTER CHOKE

ITEM No.	RATINGS: TOTAL DIRECT CURRENT	RATINGS: D. C. RESISTANCE	RATINGS: INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA: Video Products PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	REPLACEMENT DATA: TRIAD PART No.
L33	.200ADC	53Ω	1.68 Hy.	EL-154-B	C-2326 ①	C-2996 ①	TR-1733 ①	C-23X

① Drill one new mounting hole.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA: Video Products PART No. FUSE	REPLACEMENT DATA: Video Products PART No. HOLDER	REPLACEMENT DATA: LITTELFUSE PART No. FUSE	REPLACEMENT DATA: LITTELFUSE PART No. HOLDER	REPLACEMENT DATA: BUSS PART No. FUSE	REPLACEMENT DATA: BUSS PART No. HOLDER
M1	3AG-P/T (Slo-Blo)	1/4A ⓐ 125V	EF-105		315.250		MDV-1/4	

MISCELLANEOUS

ITEM No.	PART NAME	Video Products PART No.	NOTES
M2	RF Tuner	EFE-108	
M3	Focus Magnet	EL-150-1	(Includes centering device)
M4	Ion Trap Magnet		
B3 & B4	Trimmer Capacitor	ECM-120	Dual 20-270MMF, Horiz. Lockin, Horiz. Drive.

TROUBLE SHOOTING AIDS (CONT.)

PROPERTY OF
E. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLO. 80

AUDIO

WEAK OR NO SOUND

Substitute V10, V11, V12, V13 and V14. Check adjustment of ratio detector and sound IF stages. Check adjustment of A10.

BUZZ

Adjust ratio detector secondary for minimum buzz. If still noticeable, substitute V12 and readjust.

DISTORTED

Check audio amplifier stages V13A, and V14 using audio signal generator and scope;

If Undistorted	If Distorted
Check adjustment of ratio detectory and sound IF stages. Check components of V10 and V11. Check video IF alignment.	Check components of stage where distortion occurs.

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution, V18, V19, V20 and V21. Check 1/4 ampere fuse located under the chassis. Check waveform W15;

If Unsatisfactory	If Satisfactory
Check all components of horizontal oscillator and sync guide circuit. Check coupling network between V18 and V19.	Check components of horizontal output tube. Check T3, T5A, T7 and other associated components . Check damper circuit.

INSUFFICIENT HIGH VOLTAGE

Follow procedure outlined uner LOSS OF HIGH VOLTAGE. Substitute V22 and check B plus circuit.

BLOOMING

Follow procedure outlined under INSUFFICIENT HIGH VOLTAGE.

POWER

SET DEAD

Substitute V22. Check T1 and all filter components. Check for shorts in the B plus circuit.

SMALL RASTER, WEAK SOUND

Follow procedure outlined under SET DEAD.

DIM PICTURE

Follow procedure outlined under SET DEAD and check picture tube.

GENERAL

RASTER BUT NO PICTURE OR SOUND

Substitute V2, V3, V5, V6 and V7. Check video IF alignment.

SNOWY PICTURE

Substitute V1 and check components.

SOUND BUT NO PICTURE

Check V7B, V8 and associated components. Check AGC circuit.

INTERMITTENT STREAKS

Check high voltage circuit for corona arcing and discharge.

Symptoms shown above are assumed and are not indicative of the quality and workmanship of this receiving equipment.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the RF Tuner Oscillator Circuit may be accomplished by removal of the Channel Selector and Fine Tuning knobs. The adjustments are accessible, one at a time, through the small hole in the cabinet to the right of the Channel Selector shaft.

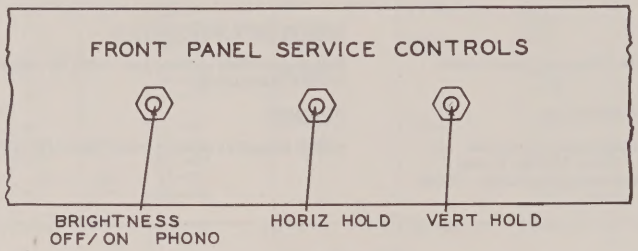
PICTURE TUBE SAFETY GLASS CLEANING

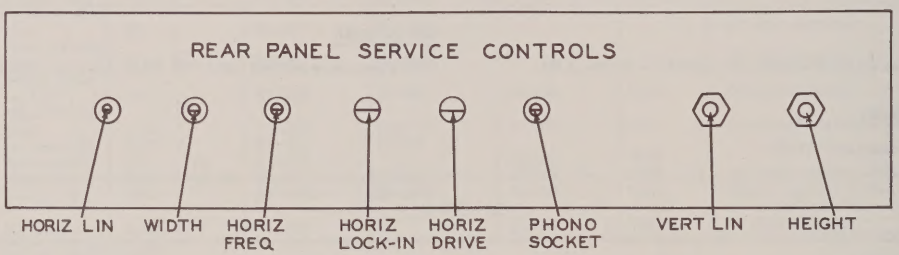
For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION





HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the Horiz. Oscillator circuit can be made from the rear panel of the chassis. Set the Horiz. Hold Control at the mid-position of its range and adjust the Horiz. Freq. Slug until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate Sound IF Detector Buzz, adjust the Ratio Detector Secondary L30 located on top of chassis. (See tube placement chart).

FUSES

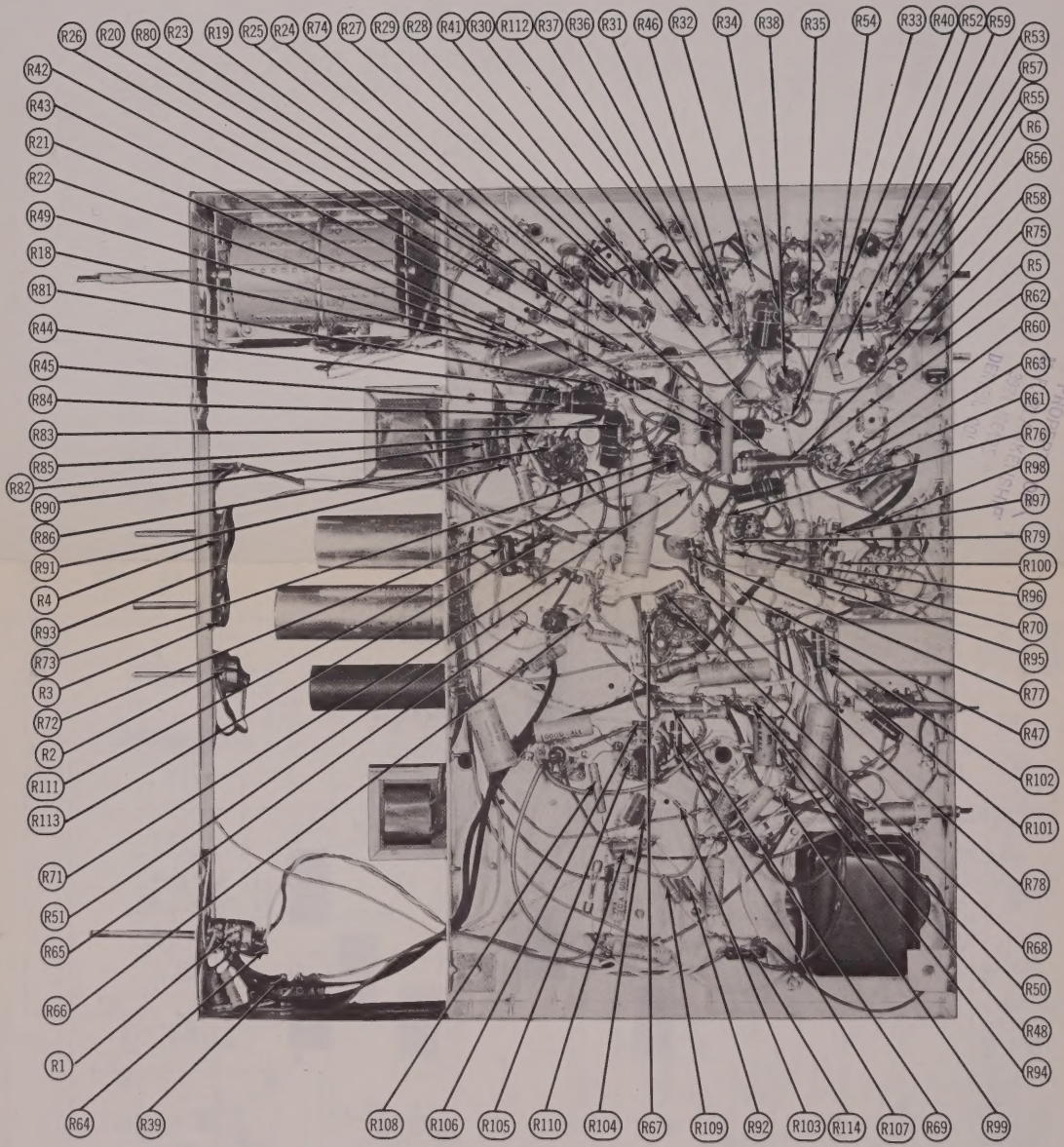
One fuse is used for Horizontal Sweep Circuit protection. (For location , see tube placement chart).

CENTERING

Centering is accomplished mechanically by means of a centering lever on the PM Focusing assembly. Adjust the centering lever from side to side, and up and down until the picture is properly centered.

DISASSEMBLY INSTRUCTIONS

1. Remove 4 push on type control knobs from front panel.
2. Remove 10 wood screws. Remove rear cover.
3. Disconnect built-in antenna. Remove 2 wood screws. Remove antenna bracket.
4. Disconnect speaker plug, yoke plug, CRT socket, HV lead.
5. Remove 1 metal screw. Remove yoke bracket ground.
6. Remove 6 chassis bolt. Remove chassis.
7. Remove 4 speaker nuts. Remove speaker.



CHASSIS BOTTOM VIEW- RESISTOR IDENTIFICATION